

Harvard School Of Public Health

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UNIVERSITY
1981/82

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Academic Calendar, 1981-82

Fall Term

*September 14, Monday

Orientation and registration for new international students: 10:30 A.M., Shattuck International House, 203 Park Drive.

*September 15, Tuesday

Registration for new U.S. students: 12:00-2:00 P.M., G-Level, Kresge Building.

Opening Session for all new students: 2:00-4:00 P.M., G-1 auditorium, Kresge Building.

*All new students are required to attend the opening session and to be present for the registration period.

September 16, Wednesday

Registration for all returning students, 9:00-5:00 P.M., G-Level, Kresge Building. Students who fail to register on the appointed dates will have a \$10 late fee assessed on their fall term bills.

The period between the opening sessions and September 21 will be devoted to orientation lectures, individual conferences with faculty members, and selection of courses of study.

September 21, Monday

First period "a" courses begin.

September 30, Wednesday

Study cards for *all returning students* due by 5:00 P.M. in Registrar's Office. Students who hand in late study cards will be charged a \$10 fee. Once a study card is filed, all changes must be made on drop/add petitions. A \$10 fee is charged for each petition submitted. Students are allowed one free petition during the "b" and "d" periods.

October 7, Wednesday

Study cards for *all new students* due in Registrar's Office by 5:00 P.M. Students who hand in late study cards will be charged a \$10 fee. Once a study card is filed, all changes must be made on drop/add petitions. A \$10 fee is charged for each petition submitted. Students are allowed one free petition during the "b" and "d" periods.

Last day to drop/add and change grading options for "a" and "ab" period courses.

Last day to cross-register at HSPH for "a" and "ab" courses.

Last day to register for the fall term at HSPH. Last day to cancel registration with refund of term bill payment.

October 12, Monday

Columbus Day, a holiday.

October 21, Wednesday

Bound, signed theses due by 5:00 P.M. in the Registrar's Office for doctoral students applying for November degrees.

November 11, Wednesday

Veterans' Day, a holiday.

November 13, Friday

First period ends.

November 16, Monday

Second period "b" courses begin.

Students are allowed one drop/add petition for "b" and "bc" courses without charge.

November 26 through November 29

Thursday through Sunday

Thanksgiving recess.

December 1, Tuesday

Deadline for filing degree applications for degree in March, 1982.

Deadline for applications for Non-resident doctoral status for spring term.

December 2, Wednesday

Last day to drop/add and change grading options for "b" and "bc" period courses. Last day to cross-register for "b" and "bc" courses.

December 20, 1981-January 3, 1982

Sunday through Sunday

Recess.

January 11, Monday

Spring study card materials available in Registrar's Office for continuing students. *Note:* Students registered through the year will not be allowed to file study cards for the spring term until all fall tuition and at least one-quarter of the spring tuition has been paid.

Last day to add "e" period courses.

January 22, Friday

Second period courses end. Deadline for completing previous spring term courses given *Incomplete*.

January 25 through January 29

Monday through Friday

Supervised special studies or field observations: "e" period.

February 1, Monday

Registration for students not enrolled during the fall semester. Students should come in person to the Registrar's Office by 5:00 P.M.

Degree Calendar

For a diploma for a degree to be awarded in:

November, 1981

March, 1982

June, 1982

Degree applications are due in Registrar's Office on:

August 15, 1981

December 1, 1981

April 7, 1982

Bound theses are due in the Registrar's Office on:

October 21, 1981

February 24, 1982

June 3, 1982

Spring Term

February 3, Wednesday

Third period "c" courses begin.

February 12, Friday

All study cards due in Registrar's Office by 5:00 P.M. Students who hand in late study cards will be charged a \$10 fee. After a study card is filed, all changes must be made on drop/add petitions. A \$10 fee is charged for each petition processed. Students are allowed one free petition during the "d" period.

February 15, Monday

Washington's Birthday, a holiday.

February 19, Friday

Last day to drop/add and change grading options for "c" and "cd" courses.

Last day to cross-register at HSPH for "c" and "cd" courses.

Last day to register for the spring term or to cancel registration with refund of spring term bill payment.

February 24, Wednesday

Bound, signed theses due by 5:00 P.M. in the Registrar's Office for doctoral students applying for March degrees.

March 26, Friday

Third period ends.

March 28 through April 4

Sunday through Sunday

Spring recess.

April 5, Monday

Fourth period "d" courses begin.

April 7, Wednesday

Deadline for filing degree applications for degrees in June.

April 14, Wednesday

Last day to drop/add and change grading options for "d" period courses.

Last day to cross-register for "d" courses.

May 3, Monday

Last day to file petition for Nonresident doctoral status for the academic year 1982-83.

May 28, Friday

Fourth period ends. Deadline for registration and tutorial forms for HSPH summer tutorials. Deadline for completing fall term courses given *Incomplete*.

May 31, Monday

Memorial Day, a holiday.

June 3, Thursday

Bound, signed theses due by 5:00 P.M. in Registrar's Office for doctoral students applying for June degrees.

June 1 through June 9

Post-class period.

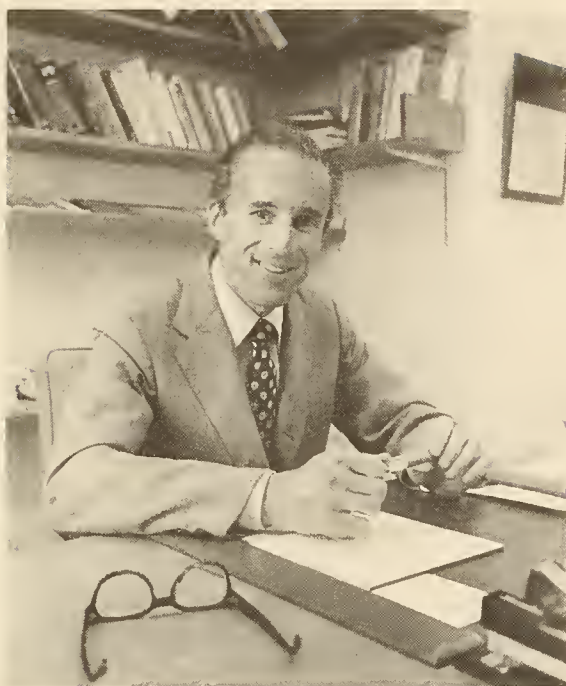
June 10, Thursday

Commencement.

August 16, Monday

Deadline for filing degree applications for degree in November, 1982.

A Note from the Dean



The School's primary missions are the education of scholars who seek to understand and ameliorate the health problems of society, the execution of the research that addresses those problems, and the training of professionals who deal with them. The scope of its teaching and research programs extends all the way from the development of concepts and methods through studies of natural phenomena and of policy development, to the ultimate steps of implementation and evaluation. The School's programs concern two major areas. The first is disease prevention and involves the biological, chemical, physical and social factors that affect the health of society. The second is the organization and function of systems involved in the delivery of health services.

Public health is not itself a discipline, but its practitioners require expertise in one or more of a group of disciplines. The increasing complexity of public health questions requires the skills of quantitative analytic, natural, behavioral, social, and managerial scientists. The academic programs of the School must impart a sound background in a basic discipline as well as an active and credible experience in the application of the discipline to health problems. They must also demonstrate how people from different disciplines can cooperate in approaches to health problems.

We are a professional school. Strong training programs are required for new health professionals and for those in mid-career status. Health care systems in this country and abroad require professionals well-equipped to plan and manage the use of resources. With recent and prospective changes in health policy in the United States, our professional graduates must be equipped to anticipate, encourage and deal with change, and to be among its leaders. In our complicated society, critical problems in areas such as occupational health, nutrition, population, and pollution of the air, the soil and the water all share certain characteristics. A better data base of solid scientific information is essential, but inadequate by itself, to equip professionals to identify and implement socially appropriate and effective policy. Resources are scarce, and costs and benefits must be calculated. Large organizations must often be influenced to change their behavior and large groups of people mobilized to implement new policies. And this must be done in a context in which available data are incomplete, inference difficult, and the world not well understood.

The School's professional programs, therefore, must be based on both natural and social sciences and must depend heavily on quantitative analytic methods. The programs must emphasize a symbiotic relationship between our historically strong areas and a potentially unique set of analytic and managerial skills applied to health — all of which are needed to improve public health in the current context. This is true not only for degree programs designed to train new health professionals, but also for our efforts to rapidly assist today's public health professionals by making available strong mid-career educational opportunities.

The School has traditionally sponsored programs directed at the health problems of the developing world. Disease, malnutrition, population excess relative to resources, and the closely linked problems of inadequate educational opportunities and economic under-development are of great professional concern to much of our faculty and student body. That the School should be concerned with these critical problems is generally agreed. The question of appropriate roles for the School in this area is now receiving much faculty attention, and will surely be guided by the judgment and advice of colleagues from developing countries. As health programs in those countries evolve, continuing change in our programs can (and should) be anticipated.

The boundaries of public health are ever widening, and this School has assumed a leadership role in that process. It is continuing its commitment to traditional public health approaches and integrating them with approaches more recently identified as important. Our students must gain an appreciation of, and participate in, the major contributions to health made by a growing circle of disciplines.

Howard H. Hiatt

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Degree Requirements

The School of Public Health offers programs leading to the graduate degrees of *Master of Public Health* (M.P.H.), *Doctor of Public Health* (Dr.P.H.), *Master of Occupational Health* (M.O.H.), *Master of Science* in a specified field (S.M. in . . .), and *Doctor of Science* (S.D.). The general degree requirements and the respective requirements for admission are discussed in the following sections.

Master of Public Health

The program leading to the Master of Public Health degree consists of one academic year of study designed to prepare professionals for careers in public health practice. Through the core curriculum, the program provides a broad background in various disciplines basic to public health. Through the choice of elective courses students may acquire more breadth of knowledge or may pursue in some depth one or more areas of particular relevance to their career goals. The M.P.H. degree program may serve as a required academic year for residency training in General Preventive Medicine and Occupational Medicine (see p. 19).

Requirements for Admission

Applicants to the M.P.H. program must satisfy the Committee on Admissions and Degrees as to their academic ability, the relevance of their previous education and experience, and their overall qualifications for graduate professional education in public health. Ordinarily, an applicant should hold a doctoral degree in medicine, dentistry, or veterinary medicine. Consideration is also given to applicants who hold doctoral degrees in biology, behavioral sciences, other natural sciences and social sciences, or law, economics, engineering, and certain related fields regarded by the School as appropriate background for entrance into the public health profession. Applicants who hold an earned doctoral degree are urged to submit scores from the Aptitude Test of the Graduate Record Examination (GRE) or other aptitude tests such as the Law School Admission Test (LSAT), the Medical College Admission Test (MCAT), or the Dental Aptitude Test (DAT), if available.

Consideration for admission to the M.P.H. program is given also to an applicant who holds a master's degree in a field related to public health such as nursing or social work, with a highly distinguished academic record, and substantial professional experience (usually at least three years in an administrative position of responsibility). These applicants must be able to demonstrate sufficient knowledge and competence to satisfy the Committee on Admissions and Degrees as to their qualifications for professional public health education and must submit scores from the Aptitude Test of the Graduate Record Examination. Scores from the GRE Aptitude Test should be no more than five years old.

Applicants from countries where English is not the language of instruction must submit a score from the Test of English as a Foreign Language

(TOEFL). Ordinarily, the TOEFL score must be 550 or better before the applicant can be considered for admission.

If a student who is enrolled in the M.P.H. program wishes to continue at the School after completing the M.P.H., he or she may consider applying for a Master of Science or doctoral program in any of the departments which offer such programs for which he or she meets the requirements. Interested students should refer to the section on admissions for procedures and application deadlines.

Requirements for the Degree

An M.P.H. degree candidate must spend one academic year in residence at the University and must successfully complete courses totaling a minimum of 40 credit units. Students will be encouraged to take a total of 45 to 50 credit units.

Candidates for the M.P.H. degree are expected to complete the requirements in one academic year of full-time study. In rare instances, upon written request to the Committee on Admissions and Degrees, a student may be allowed to complete the program over a period of two academic years. The M.P.H. core courses must be completed in the first year.

Students who have taken courses at the School prior to entrance into this degree program may be able to use those courses to satisfy specific M.P.H. or departmental course requirements, but they must still complete a minimum of 40 credit units as degree candidates. In any event, students are required to pay one full year of tuition.

The Core Curriculum

The core curriculum, required of *all* M.P.H. degree candidates, is designed to provide a fundamental knowledge of the major areas of public health. Students must take the four core courses which cover the environment, quantitative methods, and health administration and management. In addition, students select one of four courses which use the case method to integrate the various disciplines of public health. The core courses are:

EH1 201a&b (or c&d) Principles of Environmental Health (5 credit units)

BIO 101a,b Principles of Biostatistics (5 credit units)

EPI 201a Introduction to Epidemiology or EPI 221a,b Epidemiology in Public Health (2.5 credit units)

HPM 221a,b Administration of Health Services (5 credit units)

AND, either

ID 221b Case Studies in Decision Making in the Control of Infectious Diseases of Public Health Importance (2.5 credit units)

or

ID 222d Case Studies in Health Organization in Developing Countries (2.5 credit units)

or

ID 223c Case Studies in Public Health Decision Making (2.5 credit units)

or

ID 225c A Case Study in Urban and Industrial Health Planning in a Developing Country (2.5 credit units)

Ordinarily, the core courses represent less than half of the total number of credit units recommended for the degree, thus allowing for flexibility in the program. Descriptions of each course appear in the section, *Courses of Instruction*.

Master of Public Health Program Office

Chief Coordinator: Dr. Drolette

Coordinators: Dr. Boyer, Dr. Monson, and Dr. Nichols

The coordinators have day-to-day responsibility for the M.P.H. degree program, oversee the core curriculum, and serve as the M.P.H. Subcommittee of the Committee on Admissions and Degrees. They meet regularly with the Master of Public Health Program Committee, composed of a faculty representative of each department at the School, and representatives of students, alumni, and the School administration. The M.P.H. Program Office, located in the Office of Student Affairs, serves as a departmental office for students in the General Program, and provides a central source of information about the M.P.H. degree program to all students and applicants.

Departmental Concentrations

The M.P.H. is an interdisciplinary degree and does not carry a departmental designation. Many students have specialized goals and they choose to take most of their elective courses in one department. They often prefer to concentrate in that department. Departments differ in their expectations of M.P.H. degree candidates. Some advise them to take a specific set of courses over and above the M.P.H. core curriculum, while others determine students' needs on an individual basis. For further information about a specific departmental concentration, please check with the department.

The General Program

The General Program, under the direction of the coordinators of the M.P.H. program, takes cognizance of the fact that many students seek a broader view of public health than that which a departmental affiliation offers. Students in the General Program may choose their elective courses from a variety of courses offered by the School of Public Health and other faculties at Harvard and M.I.T. Faculty advisors are assigned with each student's background and interests in mind. Members of the M.P.H. Committee serve as advisors to most of the students in the General Program. Even within the General Program it is possible for a student to concentrate to some extent in a particular discipline through the appropriate choice of electives.

The International Track

The Office of International Health Programs (see p. 62) has developed a "track" for students interested in careers in international health. The courses, which supplement the core curriculum and make up the Interna-



Dr. Drolette (left) and Dr. Boyer (right) review M.P.H. alumni records with staff assistant Ruth Steinbrecher.

tional Health track, are:

ID 209a,b Health Services in Developing Countries (2.5 credit units)
Plus 2 of the following 3:

NUT 210a,b Nutrition Problems of Less Developed Countries
(2.5 credit units)

POP 200a,b Introduction to Population Sciences (2.5 credit units)

TPH 201a Ecology, Epidemiology, and Control of Important Parasitic
and Viral Diseases of Developing Countries (3 credit units)

The Office also serves as a source of information to students on other courses which are relevant to international health.

Combined Degree Programs

Students currently enrolled in an M.D., D.M.D., D.D.S., or D.V.M. program may apply for admission to the M.P.H. program, provided that a combined program can be arranged that meets the approval of both the Committee on Admissions and Degrees at the School of Public Health and the institution from which the doctoral degree is being earned. Students usually apply in their second or third year of medical, dental, or veterinary school for enrollment in their third or fourth year. Requirements for the M.P.H. degree (described on p. 10) are the same for students in the combined degree program as for all other M.P.H. degree candidates. Students enrolled in a combined degree program with the M.P.H. will receive the M.P.H. upon successful completion of both degree programs and conferral of the doctoral degree.

Doctor of Public Health

The Doctor of Public Health is an advanced professional degree for those who intend to pursue academic or research careers in public health, including administrative, planning, or evaluation roles in public health practice. The degree is granted on successful completion of an approved program of independent and original investigation in a special field of public health and the presentation of the results of this research in an acceptable thesis.

Requirements for Admission

An applicant for admission to candidacy for the Doctor of Public Health degree normally must be a graduate of an approved school of medicine, dental medicine, or veterinary medicine. Depending on the intended field of specialization, consideration may also be given to a candidate who holds an advanced degree in one of the disciplines basic to public health. In addition, the applicant must hold, or be in progress toward, the degree of Master of Public Health, or its equivalent, from an approved institution.

Applicants must be able to satisfy the Committee on Admissions and Degrees as to their overall qualifications for doctoral study at the School and must demonstrate potential ability to undertake original investigation in a special field. Scores for the Aptitude Test of the Graduate Record Examina-

tion must be submitted by all applicants who do not hold an earned doctoral degree, and should be no more than five years old.

Applicants who hold an earned doctoral degree are urged to submit aptitude scores from the GRE, or other tests such as LSAT, MCAT, or DAT, if available.

Requirements for the Degree

Formal requirements for the Doctor of Public Health degree are the same as those for the Doctor of Science degree. A brief summary of these requirements appears on p. 17.

Master of Occupational Health

The program leading to the Master of Occupational Health degree is designed to provide physicians with postgraduate training in the public health disciplines that are relevant to the development of programs to prevent occupational disease and injury. This one-year degree program may be taken as part of a two-year approved residency in occupational medicine, or it may be taken as an independent one-year program.

Requirements for Admission

Candidates must be graduates of an approved school of medicine and must satisfy the Committee on Admissions and Degrees as to their scholastic ability to study at the graduate level. Students from the United States must have completed an internship or residency of at least twelve months in a hospital approved by the American Medical Association. Applicants are urged to submit scores from the Medical College Admissions Test (MCAT) or the scores of the Aptitude Test of the Graduate Record Examination (GRE), if the latter are available.

Requirements for the Degree

Candidates for the M.O.H. degree must spend one academic year in residence at the University and must successfully complete a program of at least 40 credit units, comprising both required and elective courses.

All candidates are expected to take the following courses unless they can demonstrate equivalent preparation:

1. Biostatistics 101a,b, *Principles of Biostatistics* (5 credit units)
2. Epidemiology 201a, *Introduction to Epidemiology* (2.5 credit units) or Epidemiology 221a,b, *Epidemiology in Public Health* (2.5 credit units)
3. Environmental Health Interdepartmental 201a,201b/201c,201d, *Principles of Environmental Health* (5 credit units)
4. Physiology 205c,d, *Principles of Toxicology* (5 credit units), Physiology 207c,d, *Radiation Biology* (5 credit units) or Physiology-Microbiology 212a,b, *Introduction to Cancer Biology* (5 credit units)
5. Environmental Health Interdepartmental 207a,b, *Policy Issues in Occupational Health* (5 credit units)

6. Environmental Health Interdepartmental 251c,d, *Basic Problems in Occupational Health and Industrial Environments* (5 credit units)
7. Epidemiology 202b, *Principles of Epidemiology I: Elements of Study Design and Data Analysis* or Epidemiology 212c,d, *Environmental and Occupational Epidemiology* (2.5 credit units)
8. Environmental Health Sciences 255a, *Health Hazards of Manufacturing Processes* (2.5 credit units)
9. Environmental Health Interdepartmental 254b, *Introduction to Industrial Hygiene* (1.25 credit units)
10. Biostatistics 202c,d, *Statistical Methods in Research* (5 credit units). Not required, but strongly recommended.

The total number of credits in required courses is 33.75. Additional courses may be selected from the curriculum approved for residencies in occupational medicine.

Master and Doctor of Science

The School offers programs leading to the degrees of Master of Science in designated fields of concentration and Doctor of Science. The prospective applicant should note that in some areas, the Master of Science program is intended primarily or wholly as preparation for doctoral study; applicants are screened for their interest in, and potential for, doctoral work, and the majority of students continue toward the Doctor of Science degree. In other areas, the Master of Science is viewed primarily or wholly as a professional degree; while a small percentage of students may continue for the doctorate, the majority discontinue study upon receipt of the S.M. degree. Finally, students in still other areas are divided almost equally between those who pursue the Doctor of Science degree and those who discontinue their studies upon receipt of the S.M. degree.

Occasionally, a student may be admitted to a master's program or to candidacy for a doctoral degree in more than one of the disciplines, if the program meets the requirements of the respective departments or programs involved. In such instances, the degree conferred specifies the areas.

Because there is considerable variability among the S.M. and S.D. programs in different fields, both in their overall goals and their specific admission and degree requirements, applicants are urged to consult the program descriptions. These descriptions provide basic information about programs in specific areas; additional information may be obtained by contacting the respective departments or programs, as indicated in the degree designation.

Joint Department Degree

With the permission of the departments, students may seek a Master of Science or Doctor of Science degree from two departments within the School.

Master of Science in Specified Field

In general, the programs leading to the degree of Master of Science in a specified field of concentration are designed for students with interests in the scientific basis of public health and preventive medicine. The degree is granted upon fulfillment of a program of advanced work in the public health disciplines represented by departments and certain programs in the School. Students may be admitted to either a one- or a two-year master's program, depending upon the requirements of the particular program. Information about requirements for one- and two-year programs in various areas is included in the program descriptions.

Requirements for Admission

Applicants to Master of Science degree programs must satisfy the Committee on Admissions and Degrees as to their overall qualifications and promise for successful graduate study at the School. Applicants must also satisfy the department or program to which admission is sought that they have an adequate academic and/or professional background appropriate for specialization in that field.

Conditions of eligibility for one-year or two-year programs vary with the area or department in which a student wishes to specialize. Prospective applicants should consult program descriptions for more specific information.

Generally, eligibility for admission to a one-year program is limited to graduates of approved schools of medicine, dentistry, or veterinary medicine, or to applicants who have earned doctoral or, for some programs, master's degrees in fields acceptable to the department(s) to which admission is sought. Applicants holding master's degrees may be considered for admission to one-year or to two-year programs, depending upon their prior educational and professional background and upon the particular requirements of the program to which they wish to apply.

An applicant holding a baccalaureate degree is normally considered for admission to a two-year program, in order to complete the requirements for a Master of Science degree. For a few programs, including industrial hygiene, air pollution control, and radiological health, applicants may be considered for a one-year program if they hold a bachelor's degree with adequate scientific and engineering training and if they have had at least two years of relevant professional experience in the field of specialization.

Occasionally, a year or more of appropriate graduate work in an approved institution may enable a student to fulfill two-year program requirements in one year. In some cases, however, program requirements are such that a student must spend one-and-a-half or two years in residence in order to complete the necessary courses, regardless of prior training and experience.

All candidates for admission to a Master of Science program, who do not hold an earned doctoral degree, must submit scores from the Aptitude Test of the Graduate Record Examination. Applicants who hold an earned doctoral degree are urged to submit scores from the GRE or other tests such as the Law School Admission Test (LSAT), the Medical College Admission Test (MCAT), or the Dental Aptitude Test (DAT), if available.

The GRE is required for *all* applicants to the Department of Health Policy and Management except physicians, dentists, and medical or dental students applying for the Medical/Dental Track who may submit the MCAT or DAT scores.

Applicants are advised to take the Graduate Record Examination no later than the December test administration date. In order to expedite the admissions process, applicants who have taken the Graduate Record Examination in a prior academic year are advised to send a photocopy of their own G.R.E. "Report to the Candidate" when returning their completed application form. GRE scores submitted should be no more than five years old. An official score report must be received from the Educational Testing Service before final action will be taken on the application. Additional information concerning the Graduate Record Examination requirement is included in the instructions accompanying the application form.

Requirements for the Degree

Students admitted to a one-year program must spend a minimum of one academic year in residence at the University and must successfully complete a program of at least 40 credit units. Students admitted to a two-year program must spend two academic years in residence and must successfully complete a program of at least 80 credit units.

While specific course requirements vary from program to program, all candidates for a Master of Science degree are required to take Biostatistics 101a,b and Epidemiology 201a or 221a,b, unless they can demonstrate equivalent preparation. Candidates who do not have a background in medicine or biology are advised to take Physiology 203a,b, or its equivalent, or a course in general biology elsewhere. Beyond these minimal course requirements, each program may specify additional courses that are necessary for satisfactory fulfillment of degree requirements in the particular area of specialization. These specific course requirements are generally *not* listed in this catalog. The student should consult with his or her adviser or department or program head about these requirements before deciding which courses to take.

Combined Degree Programs

The admission and degree requirements for the Master of Science degree are the same as those listed for Master of Public Health degree.

Doctor of Science

The Doctor of Science degree is an advanced graduate degree for those who intend to pursue academic or research careers in public health. The degree is granted on successful completion of a program of independent and original research in one of the basic disciplines of public health, and upon the presentation of this research in an acceptable thesis.

Requirements for Admission

Applicants for admission to candidacy for a Doctor of Science degree must satisfy the Committee on Admissions and Degrees and the department of specialization as to their overall qualifications for doctoral study and their ability to undertake original research in their chosen field. All candidates for a Doctor of Science degree must hold a baccalaureate degree. In some instances, an applicant will be expected to complete the Master of Science degree at the School before being granted admission to doctoral study. In such cases, the student will first be admitted to a Master of Science program. Scores for the Aptitude Test of the Graduate Record Examination must be submitted by all applicants to doctoral programs, who do not hold earned doctoral degrees, and should be no more than five years old. Applicants who hold an earned doctoral degree are urged to submit Aptitude Test scores from the GRE, or LSAT, MCAT, or DAT tests, if available.

Because specific prerequisites vary with the discipline or field of specialization, prospective applicants are urged to consult the program descriptions in this *Register* and the department or program to which admission is sought for more detailed information.

Requirements for the Degree

A minimum of two academic years of full-time study in residence at the University is required of students enrolled in the doctoral program. The required work and preparation of an acceptable thesis, however, ordinarily takes longer. Residence requirements are fulfilled by payment of tuition (see pp. 72, 74) and pursuit of an academic program approved by the department of concentration and the Committee on Admissions and Degrees.

The Committee on Admissions and Degrees is responsible for overseeing the programs of all doctoral students. During the registration period each new doctoral student will receive a manual detailing the principles and procedures that are to be followed. A brief summary of requirements is given below.

Each doctoral student is required to take 40 to 60 credits in graduate-level courses distributed over a major and two minor fields. Each minor field will ordinarily consist of at least 10 credits in formal courses. Such requirements may be reduced in cases of prior relevant coursework or experience. They may be increased in cases where there has been a substantial shift in field. Courses in the major and minor fields must be completed with distinction, with grades of "A" or "B." Doctoral students are expected to take courses in biostatistics through the intermediate level (ordinarily BIO 202c,d). De-

partments may stipulate specific course requirements and may require written and/or oral examinations on the coursework in the three fields.

Qualifying Examination

By the end of the second year the student should be prepared to take the oral qualifying examination. The main emphasis of this examination is to assess the student's potential to perform research in his/her chosen field. Since most doctoral research in the School requires a substantive knowledge of more than one discipline or field, the examining committee will include faculty from disciplines representing the minor fields as well as the major. The examination will include questioning in the major and minor fields outside of the proposed research.

A research committee consisting of the student's adviser and other faculty members is to be appointed within one month after the qualifying examination is passed. This committee has the responsibility for guiding the student's research through to completion. It will meet with the student at least once every six months to discuss details of the student's progress.

Thesis

An acceptable thesis must ordinarily be submitted within five years of the date of registration as a doctoral candidate. The thesis should consist of one or more manuscripts suitable for publication in a scientific medium appropriate to the candidate's field. Detailed requirements are available from the Registrar.

The thesis will not be accepted until a public presentation and discussion has been held, with the research committee in attendance.

Three bound copies of the approved thesis must be in the Registrar's Office before the faculty will vote the degree at its special meetings in October, February, or June.

Occasionally, thesis work will be performed *in nonresident* status. Before the doctoral subcommittee of the CAD grants such status, it is necessary that the research committee meet with the candidate to appraise the thesis plan. Agreement must be reached and the doctoral subcommittee must be advised in writing *before departure of the student* as to (1) acceptability and feasibility of the proposed thesis plan; (2) the timing and scope of the periodic written reports that will be required of the student; (3) arrangements that have been made or will be made for direct field supervision of the student; and (4) the minimum period of time the student will spend back at the School before the presentation and defense of the thesis. In no case will the doctoral subcommittee grant *in nonresident* status for more than one year at a time.

Students wishing further information on doctoral program requirements should refer to the *Guidelines for Doctoral Study* available in the Registrar's Office.

Residency for Board Certification

The School offers approved residency training leading to certification by the American Board of Preventive Medicine in the following areas:

- General Preventive Medicine, in the specialty areas of
 - Epidemiology
 - Health Services Administration
 - International Health
- Occupational Medicine

For physicians who apply and who are accepted into a General Preventive Medicine or Occupational Medicine Residency, credit is given for one or two years of study leading to one or more public health degrees. A residency may also include supervised experience which may or may not be part of a doctoral program.

Additional information about the residency programs may be obtained from Dr. Brian MacMahon, Chairman of the Department of Epidemiology (for the General Preventive Medicine residency); Dr. Alonzo Yerby, Professor of Health Services Administration (for the specialty area of health services administration of the General Preventive Medicine residency); Dr. Manuel Herrera-Acena, Associate Professor of Medicine in the Department of Nutrition (for the specialty area of international health of the General Preventive Medicine residency); and Dr. Edward Baker, Assistant Professor of Occupational Medicine (for the Occupational Medicine residency).

None of the residencies as such involves stipend or other financial support. Some financial support may be available through traineeships or National Research Service awards for degree programs (U.S. citizenship or permanent residence status required). Further information on financial aid can be obtained from the individuals listed above, or from Ms. Margaret C. Salmon, Director of Financial Aid.

Postdoctoral Fellowship Program in Dental Public Health and Dental Care Administration

The School of Dental Medicine, in cooperation with the School of Public Health and the Massachusetts Department of Public Health, offers a program covering three academic years of postdoctoral study, intended to prepare a limited number of individuals for creative full-time teaching, research, and/or administrative careers in dental public health and dental care organization. Each person accepted into the program will be appointed as a Clinical or Research Fellow in Dental Care Administration at the School of Dental Medicine. The program is open to dentists and other qualified health professionals.

The program is in three parts of approximately one year each, which need not be completed in succession. One part of the program involves a formal course leading to a degree of Master of Public Health. The M.P.H. core courses must be completed in the first year at the School of Public Health and all requirements for the Master of Public Health degree in a maximum

of two academic years. Candidates with an M.P.H. or equivalent from another school, however, may be accepted into the Postdoctoral Fellowship Program with one year advanced standing. The second portion involves a one-year supervised residency at the community, state, or national level in health policy and administration. This residency meets the requirements of the American Board of Dental Public Health. The third portion affords opportunity for advanced didactic work and research at the School of Dental Medicine, the School of Public Health, other departments of the University, and/or other institutions. Epidemiological or health services research can be carried on over the entire three-year period in a variety of situations involving either new or continued studies. A research thesis is prepared for presentation at the end of the third year.

Fellows in Dental Care Administration who wish to become candidates for a degree in public health must meet the admission requirements of and be accepted into the School of Public Health. Application should be made directly to the School of Dental Medicine, whose Committee on Postdoctoral Education will forward the applicant's file to the School of Public Health for consideration.

Upon successful completion of this program, the candidate will receive the M.P.H. degree from the School of Public Health, as well as a Certificate of Postdoctoral Study in Dental Care Administration and a certificate of completion of residency requirements from the Harvard School of Dental Medicine.

Academic study beyond the master's level may be arranged with the School of Public Health and other departments of the University.

For further information and application forms, write to the Head, Committee on Postdoctoral Education, Harvard School of Dental Medicine, 188 Longwood Avenue, Boston, Massachusetts 02115.

Departments and Programs

Department of Behavioral Sciences

William E. McAuliffe, A.B., A.M., and Ph.D., Associate Professor of Sociology and Acting Chairman of the Department

Faculty

Professor and Visiting Professors Hamburg, Rosenkrantz and Mertens; Associate Professors Benfari and Masnick; Assistant Professors Gortmaker, McAlister and D. Walker; Lecturer Wechsler

Teaching and Research Staff

Research Associate/Lecturers Eckenrode and Manning

Introduction

The Department of Behavioral Sciences seeks to train researchers, teachers and professionals in the knowledge and analytical skills of the behavioral sciences relevant to significant public health issues. The specific focal points for teaching and research are: (1) the influences of behavior on health and disease; (2) health promotion and education programs; (3) behavioral aspects of health services, including psycho-social factors affecting the utilization of services and compliance with medical regimens, as well as the behavior of health professionals; (4) behavioral pathologies including addiction to drugs and alcohol, mental illness and child abuse; and (5) social science methodologies as applied to public health problems and the evaluation of health services and programs.

Degrees

Master of Public Health with concentration in Behavioral Sciences; and Master and Doctor of Science in Behavioral Sciences.

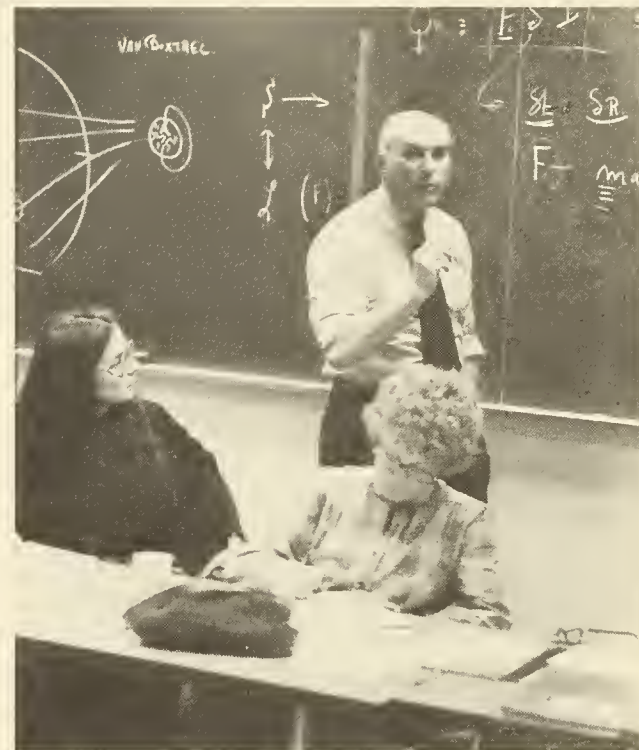
Research

The Harvard unit of the nationwide Multiple Risk Factor Intervention Trial (MRFIT) reached the halfway point in the 10-year testing of the hypothesis that mortality from coronary heart disease can be reduced by altering the risk factors of elevated blood pressure, elevated blood cholesterol and cigarette smoking. Results of intervention efforts thus far show substantial reductions in all three risk factors.

A project entitled Field Study of Youth Health Promotion Processes is being conducted to determine how unhealthy life-styles are adopted and what interventions can prevent the onset of smoking, alcohol and drug abuse. It is being implemented in inner city schools and suburban schools in Boston and in two small towns in California in collaboration with researchers at Stanford University.

The Harvard Community Child Health Studies is a multidisciplinary research and evaluation project in three communities (Flint, Michigan, Cleveland, Ohio, and Berkshire County, Massachusetts), designed to examine many policy-relevant issues related to the identification of child health problems as well as the design and implementation of programs and policies to meet child health needs.

Research on medical sociology: studies on ethnic variations in response to health care, with special attention to consumer satisfaction are being



Dr. Mertens of Behavioral Sciences lectures on "Inducing Social Change."

Some of the courses that the Department offers are listed below. The corresponding descriptions are on page 90.

The American Household in Demographic Perspective; Health and Behavior; Sociological Perspectives in the Study of Health Attitudes and Behaviors; Inducing Social Change; Health Promotion; Change of Health Behaviors; Behavior Analysis; Implementation of Intervention Programs; Case Studies in Health Promotion; Psychiatric Epidemiology: Problems, Concepts, and Methods; Substance Abuse; Methods of Social Research: Design and Measurement; Methods of Social Research: Data Collection and Analysis; Tutorial Programs; and Research Training.

In conjunction with another department: Child Development and Social Policy.

undertaken. Other projects include the study of patient compliance with medical regimens and the genesis of children's health beliefs and behaviors.

Research on opiate addiction among street addicts, recovering medical professionals and medical patients is also underway. The efficacy of self-help groups in preventing relapse in heroin addicts is being experimentally evaluated in Boston and Hong Kong. The study also seeks to learn the causes of relapse and how treatment programs may be improved.

A research project entitled Support Systems, Stress and Primary Health Care is funded by the National Center for Health Services Research. This study seeks to assess the role of stress and social support systems in the utilization of primary care health services at a neighborhood health center in Boston.

Surveys of special populations, particularly teenagers and young adults, are being conducted with regard to patterns of alcohol consumption, drug use, and related behaviors.

Programs

The majority of students are enrolled in the doctoral program.

Goals

Designed to train persons to perform significant research on behavioral aspects of health and health services. Students learn research skills, techniques of applying behavioral sciences to public health issues, and relevant elements of behavioral disciplines.

Curriculum

Students take introductory and advanced courses in statistics, research methods, and epidemiology. Research training is also gained by participation in the faculty's research projects. Course work is done in areas of health and behavior, health promotion/education, behavioral aspects of health services, and behavioral pathologies. (See p. 9 for specific degree requirements.)

Admission

Applicants for the doctoral program must have a baccalaureate degree and preferably an advanced degree in a related behavioral science discipline or medicine. These individuals are admitted directly into the doctoral program.

Career Outlook

Recent graduates have taken research and teaching positions in major health institutions and academic settings.

Department of Biostatistics

Marvin Zelen, S.B., A.M., Ph.D., Professor of Statistical Science and Acting Chairman of the Department

Faculty

Professors and Visiting Professors Drolette, Greenhouse, Miettinen, Mosteller, Reed, Weinstein, and Williamson; Associate and Visiting Associate Professors Lagakos, Louis, Pagano, Petkau, Schoenfeld, Tsiatis, and Ware; Assistant Professors Anderson, Begg, Feldman, Feldstein, Gelber, Gelman, Laird, Lavin, MacIntyre, Mehta, Stanley, and Waternaux; Lecturers Bailar, Kent and Neff

Teaching and Research Staff

Research Associate Lew

Introduction

The Biostatistics program is designed to prepare students for careers in the application of statistical and mathematical methods to the design and analysis of health research studies, and to the planning and evaluation of health services programs. Twenty-nine faculty participate in this program, which includes training in research, collaboration, and teaching. The graduate program offers four advanced degrees — three Master of Science degrees and the Doctor of Science degree.

Degrees

Master and Doctor of Science in Biostatistics; and Joint Department Master of Science.

Research

As part of the advanced degree program, all students work with faculty on ongoing projects in methodological research activities and scientific collaborations. In the area of methodological interests, faculty conduct research in data analysis, biometry, experimental design, multivariate methods, stochastic processes, pattern analysis, statistical computing, data base management, computer science, health policy, and cost-benefit analysis. In the area of collaboration, personnel are engaged in coordination of national clinical trials, FDA investigations, studies of institutional variation in burn patients, design of dental health surveys, environmental health, analysis of childhood growth patterns, in addition to projects in the Department Consulting Service. The Department also conducts a surgery study group and seminar series.

Programs

The majority of candidates are enrolled in Master of Science programs.

Goals

All the degree programs will train students in the following areas: (1) the use of numerical data as a basis for drawing conclusions and development of logical plans based on these conclusions; (2) the use of statistical methods in formulating problems, planning studies, conducting analyses, writing reports; and (3) the development of skills needed to collaborate and communicate effectively with scientists in related disciplines.



Dr. Waternaux lectures on "Multivariate Analysis for Quantitative Data."

The doctoral program has the following additional objectives: (1) the development of statisticians capable of conducting independent methodologic research; and (2) the training of statisticians capable of providing scientific leadership.

The courses offered by the Department of Biostatistics are designed to meet three specific needs.

First, it is essential for workers in all branches of public health to be able to draw conclusions from numerical data and to base logical action on these conclusions. This applies to the administrator who must evaluate problems and the results of his or her activities, as well as to the epidemiologist and the research worker who must apply statistical techniques to their laboratory and field problems. The course Biostatistics 101a,b is designed to give a basic command of simple methodology to all students, an appreciation of the value of the method, and an awareness of the frequent abuse encountered in the health literature.

Second, field and laboratory researchers must be able to use statistical methods in planning and analyzing their experiments. Some elective courses are designed to provide an introduction to methodology in this area. These courses are adapted to the needs of students of this School, many of whom have broad backgrounds in biological sciences while few have extensive preparation in mathematics. A minimum of mathematical exposition is therefore included in some courses intended for students in these categories. Other electives go into greater depth in particular topics. In all electives, the emphasis is on understanding the underlying assumptions inherent in standard statistical procedures and on the ability to determine when such procedures are appropriate.

Third, there is the group of students conducting graduate work in biostatistics. To meet the needs of these students, the Department offers courses coordinated with the Department of Statistics at Harvard and the Department of Mathematics at Massachusetts Institute of Technology. Specialized courses are given in data analysis, biometry, experimental design, multivariate methods, stochastic processes, statistical computing, data base management, and computer science.

Curriculum

Two-Year Master of Science

This program is intended for candidates with no prior graduate degree. Candidates should have had two semesters of calculus and one semester of linear algebra. Each student must spend two academic years in residence and complete courses totaling a minimum of 80 credit units. At least 40 credit units must be taken in approved statistics and epidemiology courses. The remaining credit units may be electives in the basic health sciences. Training shall include practical experience in teaching, data analysis, and computing.

One-Year Master of Science

This program is directed towards those students with a previous graduate degree in a medical, scientific or statistical field. Candidates should have had two semesters of calculus and one semester of linear algebra. Each student must spend one academic year in residence and complete courses totaling a minimum of 40 credit units. At least 32 credit units must be taken in approved statistics and epidemiology courses. Training shall include practical experience in data analysis and computing.

Joint Department Master of Science

This program is directed towards those students seeking a Master of Science from two departments within the School of Public Health. Candidates should have had two semesters of calculus and one semester of linear algebra. Students must take at least 32 credit units in biostatistics and epidemiology to satisfy the Department of Biostatistics requirements, with remaining credit units allocated to satisfying the S.M. degree requirements for the other department. Training shall include practical experience in data analysis and computing.

Doctor of Science

This program is designed for students seeking a doctoral degree. Candidates are required to have had two years of calculus and one semester of linear algebra and must submit Graduate Record Examination Aptitude test scores. Students with particularly strong backgrounds may be admitted directly to this program, while other students may be admitted subsequently, pending satisfactory completion of the Master of Science program. Each student must spend two academic years in residence and complete courses totaling a minimum of 80 credit units. Training shall include practical experience in teaching, data analysis, and computing. Any work completed at the School of Public Health towards a Master of Science degree may be applied to the Doctor of Science degree.

Further requirements include: (1) completion of a major in biostatistics (40 credit units) and a minor in mathematical statistics; (2) completion of a second minor (10 credit units) in a health-related area; (3) completion of a two-part qualifying examination; and (4) completion of a doctoral thesis.

Admission

Please see specific degree requirements on p. 14.

Career Outlook

The career outlook for biostatisticians is very promising. Biostatistics graduates have secured positions in government, universities, industry, and public health centers. Statisticians are needed in the broadly defined areas of medical care, drug therapy, health maintenance, environmental control, and health care administration. The 1978 report on professional employment needs, issued by the National Academy of Science, indicated a critical shortage of biostatisticians and epidemiologists with graduate degrees. This report also noted that shortages were likely to continue for the next five years.

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 92.

Principles of Biostatistics; Biostatistics for Medical Investigators; Statistical Methods in Research; Mathematical Foundations of Biostatistics; Survey Research Methods in Community Health; Topics in Biostatistics; Discrete Multivariate Analysis; Computing Principles and Methods; Principles of Clinical Trials; Probability Theory and Applications; Statistical Inference; Multivariate Analysis for Quantitative Data; Design of Experiments; Data Analysis; Theory of Biometry I; Theory of Biometry II; Regression and Analysis of Variance; Stochastic Processes in Medicine and Biology; Computer Programming; Introduction to Computing; Statistical Computing; Applied Data Management; Tutorial Programs, and Research.

Courses offered in conjunction with other departments are listed below.

Statistical Methods for Health Policy and Management; Forecasting and Its Use in Health Programs and Institutions; Health Program Evaluation; and Analysis of Health and Medical Practices.

Department of Environmental Health Sciences

Dade W. Moeller, S.B., S.M., Ph.D., A.M. (hon.), Professor of Engineering in Environmental Health and Chairman of the Department

Faculty

Professor First; Associate Professors Burgess, Cooper, Dennis, Hinds, D. H. Leith, Smith, and Spengler; Assistant Professors Ellenbecker and Keyserling; Lecturers Bjarngard, Cudworth, Judy, J. Shapiro, and Webster

Teaching and Research Staff

Lecturers and Visiting Lecturers Bracken, Egan, Jaeger, Mahoney, Nelson, Selby, Svensson, Varner, and Zimmerman; Research Associates Evans, Dockery, and Wolfson

Introduction

With growing public awareness of the need for environmental pollution control and worker protection, increasing attention is being focused on these problems at all levels of our society. There are four specialized programs offered by the Department of Environmental Health Sciences. Although an occasional student is admitted to a general program in environmental health sciences, for which courses may be planned to suit individual student interests and career goals, the majority of the students elect one of the specialties listed below. In addition to specialized courses, graduate education in each of these fields includes courses on human physiology, epidemiology, and biostatistics.

The Department requires that students take all Environmental Health Sciences and core program courses under the ordinal grading system. Exceptions are the Departmental Seminar and tutorial courses which are graded Pass/Fail.

The Department particularly welcomes inquiries concerning its doctoral programs. Candidates selected for these programs include outstanding S.M. degree graduates from within the Department as well as applicants who have received masters degrees from other institutions. On a limited basis, candidates with exceptionally good records at the bachelor degree level may be accepted directly into the Department's doctoral program.

Degrees

Master and Doctor of Science in Environmental Health Sciences. Generally, students who enter the program immediately after completing the baccalaureate degree enroll in the Master of Science program. Upon completion of the Master of Science program, they may continue for a doctoral degree.

Requirements

Problem analyses and the evaluation and reporting of such analyses are expected to be major components of the work of health professionals who graduate from these programs. To assure the development of these skills, each student accepted into a two-year master's program may elect to conduct an appropriate research or related study and to present a written report on it at an acceptable professional level. Such studies and the associated reports will generally be completed during the second year of the program.

The time devoted to this effort will be generally five credit units per semester, for a total of ten credit units.

Please see p. 14 for specific degree requirements.

Research

Supporting the teaching program are extensive research activities. Current studies include the evaluation of exposures to air contaminants of workers in the railroad industry, meat handling establishments and silicon carbide production facilities; development and application of personal samplers for determining individual and population doses to specific air contaminants, including those encountered indoors; development and application of engineering methods for collection of particles and pollutant gases from industrial gas streams; numerical analyses of urban scale atmospheric transport; determination of priorities for air pollution source control; evaluation of mechanisms for the adsorption of radioactive noble gases on activated carbon; analyses of failures of air cleaning systems in nuclear power plants; development of techniques for the control of naturally occurring radon and radon daughter products in homes; and evaluation of countermeasures for protecting the public in case of a nuclear accident. Supporting these studies are related cooperative research projects conducted by the Departments of Physiology and Epidemiology. As a result, students have many excellent opportunities for research, either on an independent basis or as a participant in an ongoing project.

Programs

Air Pollution Control

Goals

To provide preparation in the sciences basic to understanding air pollution research and control activities.

Curriculum

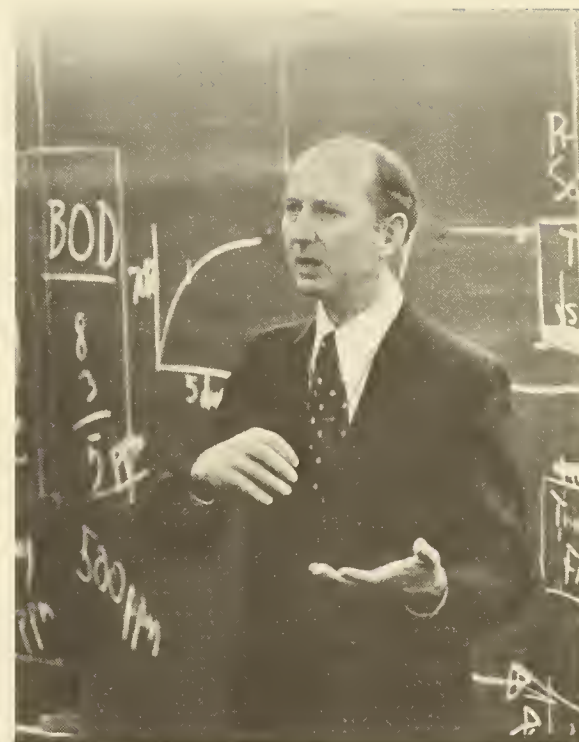
Generally includes courses in community air pollution, meteorological aspects of air pollution, identification and measurement of air contaminants, air and gas cleaning, and aerosol technology.

Admission

Candidates for the program normally have a baccalaureate degree in engineering, chemistry, physics, or biology. Those with a master's degree in a discipline closely related to environmental health and those with a baccalaureate degree plus (1) two years of directly relevant experience, or (2) three or more years of experience related to their expected degree may be able to earn the S.M. degree in one year.

Career Outlook

Recent graduates have taken positions with federal, state, or local regulatory agencies, with consulting firms, with industry, or with universities.



"Principles of Environmental Health" is the course given by Dr. Moeller, Chairman of the Department.

Some of the courses in which the Department Faculty participate are listed below. A number of these are joint offerings with Faculty members in the Department of Physiology; others are primarily under the direction of Faculty members in the Department of Physiology. Descriptions begin on p. 95.

Environmental Health Interdepartmental Courses

Principles of Environmental Health; Human Factors in Ergonomics; Introduction to Occupational Medicine; Policy Issues in Occupational Health; Mathematical Modeling for Health Sciences; Occupational Health and Safety; Critical Review of the Scientific Basis for Occupational Standards; Basic Problems in Occupational Health and Industrial Environments; Introduction to Industrial Hygiene; and Field Work.

Environmental Health Sciences

Departmental Seminars; Introduction to Operations Management; Occupational Safety Science; Environmental Control: Industrial Ventilation; Noise and Vibration Control; Aerosol Technology; Health Hazards of Manufacturing Processes; Community Air Pollution; Meteorological Aspects of Air Pollution; Identification and Measurement of Air Contaminants; Air and Gas Cleaning; Introduction to Radiation Protection; Introduction to Radiation Instrumentation; Concepts and Issues in Radiation Protection; Radiation Protection in Medicine; Tutorial Programs; and Research.

Industrial Hygiene

Goals

The master's program is designed to meet the demand for professional personnel with the skills and scientific knowledge that are needed to identify and control health stresses associated with the working environment — e.g., air contamination, noise, radiation, heat, pressure, etc.

Curriculum

Generally includes recommended and required courses dealing with basic problems in occupational health and industrial environments, policy issues in occupational health, environmental control, identification and measurement of air contaminants, air and gas cleaning, principles of toxicology, human factors in occupational performance and safety, and aerosol technology.

Admission

Acceptable candidates for the program normally have a bachelor's degree in engineering, chemistry, physics, or biology. Although this is primarily a two-year program, students with master's degrees in the above disciplines and some students with prior training or experience in related areas may be able to earn the S.M. degree in one year. It is a terminal program for most students, although a few continue toward the Doctor of Science degree.

Career Outlook

Recent graduates have taken positions with federal, state, or local regulatory agencies, with consulting firms, with industry, or with universities.

Environmental Health Management

Goals

To train professional public health personnel to manage environmental health problems, particularly in urban areas.

Curriculum

Multidisciplinary program which draws upon courses offered by the Harvard School of Public Health, by other faculties of Harvard University, and by the Massachusetts Institute of Technology. In addition to the basic course in environmental health management, students normally take a series of courses in air pollution control, industrial hygiene, radiological health (specialty areas offered through the Department of Environmental Health Sciences), or water pollution control (offered through the Division of Applied Sciences of the Graduate School of Arts and Sciences), supplemented by electives in environmental economics, public health administration, political and social sciences, environmental law, environmental planning, and health education.

Admission

Students admitted to the program normally hold a bachelor's degree in biology, engineering, geology, or another science. This program is usually two years in length and generally includes a field training assignment with an environmental health agency during the summer. Selected opportunities for continuing toward the doctoral degree are open to qualified recipients of the S.M. degree.

Career Outlook

Recent graduates have taken administrative or regulatory positions in environmental health.

Radiological Health (Radiation Protection)**Goals**

To provide students with knowledge of the fundamentals of radiation protection. Considerable attention is given to the effects of environmental releases of radioactive materials, and the associated requirements for complying with regulations and standards.

Curriculum

Includes recommended and required courses covering radiation protection, radiation biology, radiation instrumentation, radiation dosimetry, and aerosol technology.

Admission

Students admitted to the program normally have bachelor's or master's degrees in physics, mathematics, or engineering. Two years are normally required to earn the S.M. degree, although some students with prior training and/or experience in relevant areas may earn the degree in one year. About half the students continue toward the doctoral degree.

Career Outlook

Recent graduates have taken positions with the nuclear power industry, hospitals, universities, research institutions, governmental regulatory agencies, and consulting architectural or engineering firms.

Courses in conjunction with another department: Introduction to Operations Management; Political Economy of Environmental Health Regulations; and Environmental Health Policy Analysis.

Department of Epidemiology

Brian MacMahon, M.B., Ch.B., D.P.H., Ph.D., S.M. in Hyg., M.D., Henry Pickering Walcott Professor of Epidemiology and Chairman of the Department

Faculty

Professors Hutchison, Miettinen, and Monson; Associate Professors Morrison and Rothman; Assistant Professors Gutensohn, A. Walker, and Willett; Lecturer Ellison

Teaching and Research Staff

Lecturers and Visiting Lecturers Boice, Cole, Feinleib, Jick, Miller, Paffenbarger, Sartwell, and Warram; Research Associates Trapido and Yen

Introduction

The major objective of the Department is to provide opportunities for training and experience in the application of epidemiologic research methods to the investigation of diseases of unknown etiology. Emphasis is on the cardiovascular disorders, the malignant neoplasms, abnormalities of reproduction and development, and other major diseases for which preventive measures are still unknown or inadequate.

Degrees

Master and Doctor of Science in Epidemiology; and Doctor of Public Health.

Research

Research programs in the Department provide faculty members and graduate students the opportunity to work together exploring the following areas:

- the role of viruses in the etiology of cancer, particularly in relation to Hodgkin's disease
- the evaluation of different radiotherapy regimens for the treatment of Hodgkin's disease
- the epidemiology of multiple myeloma
- a national collaborative study for the management of patent ductus arteriosus
- the relationship between exposure to chemicals in the workplace and the development of cancer
- an international case-control study of bladder cancer
- population screening for cancer
- a study of congenital heart disease: examining drugs as a causative factor
- the health effects of oral contraceptives
- the study of the relationship of hormonal patterns and breast cancer
- the role of diet in the development of kidney and bladder cancers
- etiology of non-Hodgkin's lymphoma, with emphasis on immune system disturbances
- epidemiologic methods, with particular regard to significance testing in areas such as proportional mortality ratio and synergism and antagonism

Programs

Goals

The master's program is intended to provide students with basic skills in epidemiologic and quantitative methods and in computing, in preparation for research careers. The doctoral programs are designed for persons who plan careers of research or teaching in epidemiology.

Curriculum

The one-year research training program for the S.M. degree includes most of the courses offered by the Department, plus courses in principles of biostatistics, statistical methods in research, and computing principles and methods (which are offered by the Department of Biostatistics), a total of 25 to 30 credit units. Additional formal courses in areas of special interest and/or supervised research comprise the remainder of the program. The S.D. program is of four to five years' duration for persons holding baccalaureate degrees; for persons holding relevant master or doctoral degrees, however, the program is shorter, usually two to three years in length. Unless course work equivalent to that described above for the S.M. degree has been taken previously, most of the first two years of a doctoral program is occupied with courses. Subsequently, completion of a thesis and experience as a teaching assistant are the principal components. The content of the Dr.P.H. program is identical to that of the S.D. program and will vary in length, usually from two to five years, depending on the individual's background and progress with the thesis component. (Please see p. 13 for more specific degree requirements.)

Please note that either EPI 201a or EPI 221ab satisfies the requirement of an introductory course in epidemiology. However, individual programs may require one or the other.

Residency

A three-year residency in the Department has been approved as satisfying residency requirements of the American Board of Preventive Medicine for certification in General Preventive Medicine. Requirements of the approved residency and of the School's degree programs may be satisfied simultaneously. The residency does not satisfy the one-year clinical component required by the American Board of Preventive Medicine.

Admission

Acceptable candidates for the S.M. program are physicians, veterinarians, and dentists. For qualified students the period of research training may be extended by admission to either of the doctoral programs offered by the School, or by admission to special student status. Most of the training beyond the master's degree is occupied in supervised research experience. Potential doctoral candidates must plan at least two years in residence beyond completion of the master's degree.

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 99.

Introduction to Epidemiology; Principles of Epidemiology I: Elements of Study Design and Data Analysis; Principles of Epidemiology II: Problem Conceptualization and Study Design; Principles of Epidemiology III: Data Analysis and Interference; Practice of Epidemiology; Seminars; Topics in the Theory of Epidemiology; Epidemiology of Chronic Disease: Cancer and Screening; Epidemiology of Chronic Disease: Cardiovascular and Respiratory Disease; Environmental and Occupational Epidemiology; Epidemiology in Public Health; Tutorial Programs; and Research.

In conjunction with another department: Nutritional Epidemiology.



Dr. Monson poses a question to his class in "Environmental and Occupational Epidemiology."

The Department considers applications for direct admission to doctoral candidacy (S.D. degree) from persons holding baccalaureate degrees with strong backgrounds in biology and mathematics; it also encourages candidates holding other master and doctoral degrees.

The Dr.P.H. program is available to persons holding the M.P.H. degree.

Career Outlook

Some of the positions recent graduates have taken: Officer in Epidemiologic Intelligence Service, Center for Disease Control; epidemiologists at the National Cancer Institute; and appointments at universities and medical schools in research and instruction.



"Who Is at Highest Risk of Cancer?" was the topic of the departmental seminar given by Dr. Li.

Department of Health Policy and Management

C. Frederick Mosteller, S.B., S.M., A.M., Ph.D., S.D. (hon.), Roger Irving Lee
Professor of Mathematical Statistics and Chairman of the Department.

Faculty

Professors Curran, Hedley-Whyte, Herzlinger, Roberts, and Yerby; Visiting Professor Gellhorn; Associate Professors Fineberg, Hsiao, Sheldon, Stason, Thompson, and Young; Assistant Professors Barrett, P. Feldman, Hemenway, Kane, Palmer, and Thomas; Lecturers Braun, J.L. Brown, Kasten, Segall, Sherman, Trevelyan, and Yacovone

Teaching and Research Staff

Lecturers and Visiting Lecturers Allen, Bander, Berarducci, Berwick, Bishoff, Bloem, Blumenthal, Bossert, Burchfield, Bycoff, Cloherty, Cohen, Cotton, Crampton, Cupples, Densen, Douglass, Dull, Dumbaugh, Field, Holden, Irish, Johnson, Keith, Komaroff, Koplan, Landy, Liang, Lorch, Marra, Meehan, Mintz, Morris, Munier, Nesson, Nighswander, Phillips, Pyle, Rabkin, Rosenberg, Rosenthal, Sands, Schauffler, Shapiro, Shepard, Taylor, Wathne, and Winsten; Instructors Hourihan, Kingsdale, and Mariner; Research Associate Saltman

Introduction

The Department of Health Policy and Management is concerned with the allocation and management of resources to deal with public health problems. Such problems may arise in the context of public policy decisions where choices must be made among various programs and policies. Activities must then be designed and implemented, whether the problem area is the health care delivery system, environmental or occupational health, etc. Alternatively, the problem may be set within an individual institution such as a hospital or community health center where a manager must choose among competing programs and activities. Furthermore, in any setting, effective management is essential if objectives are to be achieved with the limited resources that are available.

The Department includes a two-year master's program in health policy and management, two one-year master's programs in health services administration, a doctoral program, and several executive programs. The Department's faculty is interdisciplinary, including economists, political scientists, physicians, decision analysts, management specialists, and lawyers.

Degrees

Master of Science in Health Policy and Management; Master of Science in Health Services Administration; Master of Public Health with a concentration in Health Services Administration; Doctor of Science in Health Services Administration.

Programs

Master of Science in Health Policy and Management

The two-year program in Health Policy and Management (HP&M) is designed to provide a foundation of professional training for managers, policy analysts, and planners who intend to devote their careers to working

on public health problems. The program has been designed around four key elements: 1) a dual focus on policy and management; 2) an emphasis on both skills and concepts; 3) a grounding in the substance of public health problems; and 4) a curriculum combining academic and clinical activities.

The program is based on the premise that training in an academic setting must be complemented by experience in real-world, problem-solving situations. The curriculum is updated regularly and is applied to practical situations by means of a required summer internship program and an applied research program.

Curriculum

The curriculum for the Health Policy and Management program has been tailored to reinforce the above-described philosophy. There are four important and interrelated elements:

Required Core

A set of required core courses comprise the first year of each student's two-year program. These core courses provide the basic analytic skills and knowledge needed by professionals serving in both policy and management roles in the health field. Subjects covered include: quantitative methods, particularly epidemiology (EPI 201a or 221a,b) and biostatistics (HPM-BIO 219bc, 219d); essential management skills (HPM 220a-d); an introduction to policy analysis, including microeconomics (HPM 100ab), quantitative policy analysis (HPM 211c) and political and bureaucratic analysis (HPM 250d); and substantive public health issues (HPM 240a). Students may be exempted from those core requirements in which they demonstrate prior proficiency.

Summer Internship

A required summer internship between the first and second years allows students to apply the skills and knowledge gained from the first year, and to acquire further understanding of career possibilities in the health care field.

Flexible Second-Year Curriculum

A flexible second-year curriculum is designed by each student in conjunction with his or her academic and clinical advisors. Maximum flexibility is provided in order to allow students to pursue their own particular areas of interest as fully as possible. HP&M departmental courses may be supplemented by offerings in other departments within the School, and in some instances by courses in other schools within the University, such as the John F. Kennedy School of Government. A special inter-university relationship also allows students to enroll in courses at the Massachusetts Institute of Technology. Since the School offers a variety of courses in all areas of public health, a second-year curriculum can be tailored to a student's particular interests and career objectives.

Typically, each student's second-year program of study concentrates on one of two primary skill areas (either policy or management) and in a single substantive health area (such as health services, nutrition, environment, international health, or population). Diverse course offerings allow students to develop expertise in their primary area of concentration.

Applied Research Program

As part of their second-year activities, students are required to participate in an Applied Research Program. This program includes a research project carried out in conjunction with a local public health organization or agency. Each student prepares a paper which analyzes a specific problem within the selected organization.

The applied research project is conducted under the supervision of a clinical preceptor from the host organization and a faculty advisor from the School. The experience is designed to allow students to further develop and refine those skills most appropriate to their chosen discipline. Clinical and academic members of the student's project team are selected with this end in mind, and a weekly Applied Research Seminar allows students, clinical preceptors, and faculty advisors to bring together a variety of perspectives in a structured classroom setting.

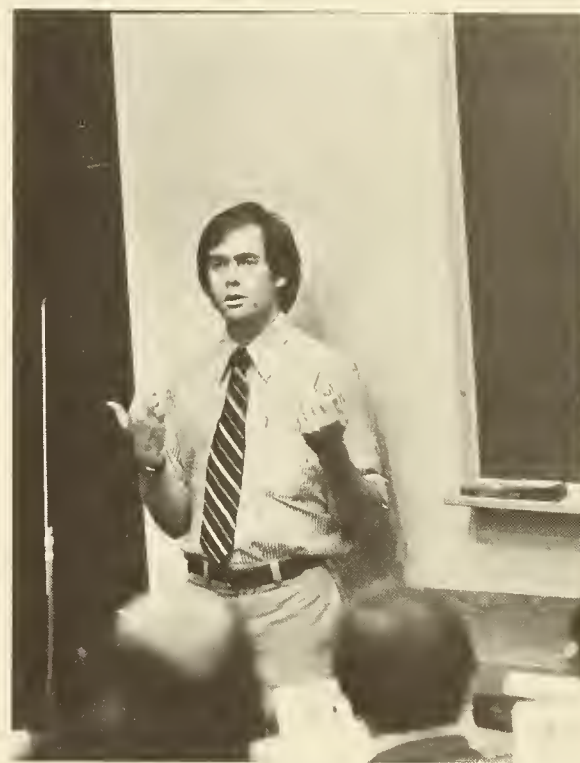
Curriculum Tracks

In addition to the four basic elements described above, the program includes curriculum tracks for physicians and dentists, and for students interested in environmental health. These tracks combine the basic core disciplines of the program with courses directed towards students' specific interests. The Medical/Dental Track contains course work in Clinical Decision Analysis, Principles of Clinical Trials, and others. The Environmental Health Track contains course work in the Political Economy of Environmental Health and Environmental Health Policy Analysis. All other students automatically would be enrolled in the general track, which contains course work in the Health Care Delivery System.

Admission

The program seeks candidates whose academic record, personal characteristics and work experience suggest intellectual competence and outstanding potential in the areas of health policy and management. Enrollment is limited to fifty or fewer students per year in order to allow for maximum interaction between students and faculty both inside and outside the classroom. All applicants must demonstrate through course work and aptitude test performance the ability to master the quantitative and analytic content of the program. Academic backgrounds in either the natural or social sciences are equally acceptable. Applications from candidates who have at least one year of pertinent post-baccalaureate work experience in the health field are considered to be most competitive for admission. (Please see Degree Requirements for Admission, p. 14 and Admissions, p. 70.)

Deferred admissions are available for a limited number of applicants who demonstrate strong potential in the field but who have not had work-related exposure to the health care system. Students who receive deferred admissions status are expected to work within the health system, in a position approved by the program, for a minimum of one year before matriculating. Applicants whose preparation appears deficient in some area, e.g. quantitative methods, may be offered provisional acceptance, contingent upon the successful completion of specific course work in advance of matriculation.



Dr. Young, Director of the Graduate Program, uses the case study approach in his class.

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 100.

Policy I: Economic Analysis; Economic Analysis for Public Health; Economics of Health Policy; Policy II: Quantitative Policy Analysis; Introduction to Operations Research; Decision Analysis and Evaluation; Seminar on Clinical Decision Analysis; Administrative Systems; Administration of Health Services; Administration of Personal Health Services; Personnel and Labor Relations; Health Care Operations Management; The Management of Organizational Design and Change; Management Control Systems; Seminar of Hospital Cost Containment; Planning in the Hospital Setting; Financial Management in Health; Introduction to Management Information Systems; Agenda for U.S. Public Health; The Health Care Delivery System; Health Systems Planning and Regulation; Design and Implementation of Health Care Regulation; Policy III: Policy Implementation; Government and Private Funding for Research and Health Care Programs; Reimbursement Systems; Quality Assurance in Health Services; Physician Performance: Facilitators and Constraints; Health and Social Welfare Systems in Cross-National Perspective; The Health Maintenance Organization: Exploring an Alternate Care System; Issues in Mental Health Policy; Dental Public Health Practice; Dentistry and Social Policy; Applied Research Seminar; Tutorial Programs; and Field Work.

One of the goals of the School of Public Health is to address the health-related problems of the underserved, both in this country and abroad. Accordingly, the program is particularly interested in receiving applications from individuals whose special concerns extend to people in inner cities, rural areas, developing countries, and other locations where such problems exist.

Career Outlook

The program has developed an effective job placement mechanism for its students, utilizing academic and clinical faculty, program alumni, and the specialized resources of the School's counseling office. Additionally, a network of contacts has been developed with potential employers throughout the country and with professionals in a wide variety of executive-level positions who have attended the School's Executive Programs in Health Policy and Management. Examples of positions secured by program graduates include: director of a community hospital; administrative director of a primary care center; director of a certificate of need program; analyst in a state regulatory agency; planner in HHS; director of a state commission on the handicapped; analyst in the Congressional Budget Office; and economist/planner with a health maintenance organization.

Master of Science in Health Services Administration

The one-year Master of Science in Health Services Administration program is designed to address the needs of individuals who have an advanced degree in a health or health-related field, and who wish to specialize in health services in the areas of health policy, planning, regulation, and/or management. Students are required to concentrate their studies in either policy or management, while at the same time attaining a basic grounding in the general area of health policy and management. In exceptional cases, applicants without a prior advanced degree, but with extensive, relevant policy and/or management experience may be eligible for admissions.

Curriculum

The curriculum for the Master of Science in Health Services Administration includes a required core for all students, departmental course work in a student's area of concentration chosen from offerings within the Department, and several electives either within or outside the Department. The curriculum totals 40 units or more during one academic year.

Required Core

A total of 17.5 units comprise the required core:

EPI 201a Principles of Epidemiology or 221a,b Epidemiology in Public Health (2.5 units)

HPM-BIO 219b,c, 219d Statistics for Health Policy and Management (7.5 units)

HPM 240a Agenda for U.S. Public Health (2.5 units)

HPM 300c,d Applied Research Tutorial (5.0 units)

With the exception of the Applied Research Tutorial, students may be exempted from those core requirements in which they demonstrate prior

proficiency. The Tutorial consists of the preparation of a written report in the student's area of concentration, focusing on a topic of interest to both the student and a member of the Department's faculty. The report format may range from a case study to a research paper, and occasionally, depending on the student's interests, may include field work.

Concentrations

Each student in the program must elect to concentrate either in the policy or the management area. Further information about course work required for either the policy or management track is available upon request to the Admissions Office.

As with the required core, students may be exempted from those requirements in which they demonstrate prior proficiency. As a minimum, however, all students must take 15 credit units of departmental courses beyond the core.

Electives

Other than the core and concentration requirements, students are free to pursue elective courses of their own choosing. Elective course work may be chosen from offerings at the School of Public Health, other schools within the University, or the Massachusetts Institute of Technology. Typically, a student's electives are chosen with the assistance of his/her academic advisor, and may include courses at the Harvard Business School, the Kennedy School of Government, and the Sloan School of Management (MIT).

Admission

The program seeks candidates who hold professional degrees at the graduate level and have some experience in health services.

Typical applicants to the program would be professionals in public health-related disciplines who expect to devote a substantial portion of time in their careers to health policy and/or management issues; lawyers who are interested in health law, patient's rights, and health planning and regulation; and residents in General Preventive Medicine who are primarily interested in health services and who wish to have an additional year of study in an academic setting beyond the one year required by the American Board of Preventive Medicine.

The program is also designed to satisfy similar needs of health professionals who do not necessarily hold an advanced degree, but who have eight to ten years' work experience in the health services area with a high degree of responsibility, and who wish to undertake academic course work in their area of specialization.

All applicants must demonstrate through course work and aptitude test performance the ability to master the quantitative and analytic content of the program. Please see Admissions, p. 70.

Courses in conjunction with other departments:

Introduction to Operations Management; Forecasting and Its Use in Health Programs and Institutions; Health Program Evaluation; Analysis of Health and Medical Practices; Statistical Methods for Health Policy and Management; Human Rights in Health; Health Planning in Developing Countries; Case Studies in the Design and Management of Population and Health Programs; Political Economy of Environmental Health Regulation; and Environmental Health Policy Analysis.

Master of Public Health with a concentration in Health Services Administration

The one-year Master of Public Health is a School-wide program designed to prepare professionals for careers in public health practice. Through the core curriculum, the program provides a broad background in various disciplines basic to public health. By concentrating in health services, a student commits him/herself to further study of issues in health policy, planning, and/or management. Such students are provided with academic advisors chosen from members of the faculty of the Department of Health Policy and Management.

Curriculum

Further information on the core curriculum for the School-wide MPH program is described on page 10 of this *Register*. In addition to the core requirements, students in the program who are concentrating in health services are expected to complete certain departmental course offerings.

Students are expected to complete a minimum of 15 departmental credits beyond the MPH core. Departmental offerings are listed starting on page 100. Students are expected to enroll in at least 5 credit units of economics as part of the 15 departmental credit units.

Elective course work may be chosen from offerings at the School of Public Health, other schools within the University, or the Massachusetts Institute of Technology.

Recommended Tracks

In choosing departmental offerings, students may elect to concentrate in either management or policy, or to undertake course work which combines the two. In this regard, the Department has developed three recommended curriculum tracks. These tracks include both recommended courses for students concentrating in management, policy, or a combination, as well as some substitutions for the MPH core courses. Detailed schematics for each track are available upon request to the Admissions Office.

Admission

Applicants must satisfy the requirements for admission to the MPH School-wide program as listed on page 9 of this *Register*. All applicants interested in a concentration in Health Services Administration must demonstrate through course work and aptitude test performance the ability to master the quantitative and analytic content of the program.

Doctor of Science in Health Services Administration

Applicants who hold a master's degree in health services, health policy and management, or equivalent, may be accepted into the Department's doctoral program. The doctoral program is designed to prepare an individual for a career in teaching and research on public health problems. Further details are available on request.

Department of Maternal and Child Health and Aging

Isabelle Valadian, M.D., M.P.H., Professor of Maternal and Child Health and Chairman of the Department

Faculty

Professors Curran, Reed, and Yerby; Assistant Professors Branch, Deykin, Gardner, and Walker; Lecturers Dwyer, Hayes, and Russell

Teaching and Research Staff

Lecturers and Visiting Lecturers DeLollis, Gold, Newberger, Ryan, and Stubblefield; Research Associates Berkey and Butler

Introduction

The Department of Maternal and Child Health and Aging is concerned with the human life cycle factors which affect individuals' life-long health status and the interventions and services needed to promote health.

Degrees

Master and Doctor of Public Health with concentration in Maternal and Child Health; Master and Doctor of Science in Maternal and Child Health.

Programs

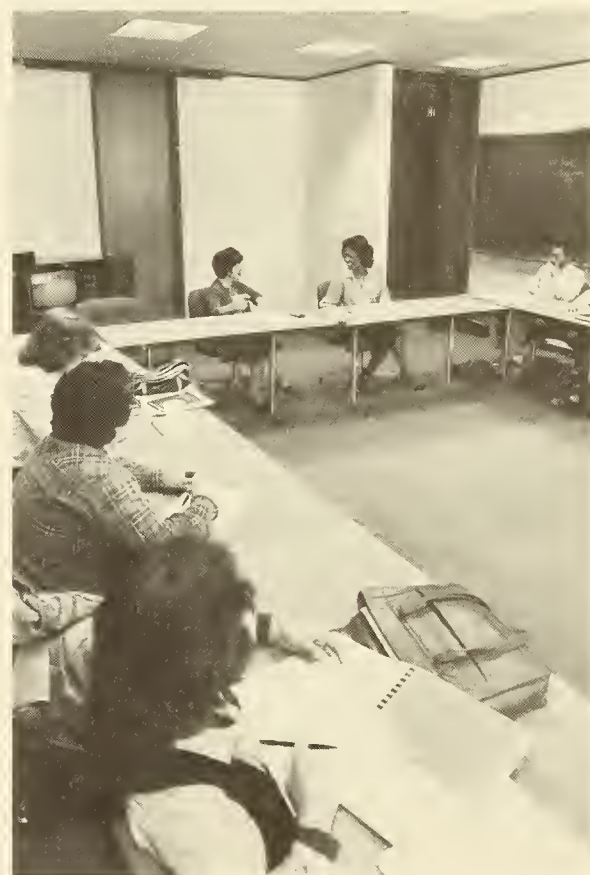
Goals/Curriculum

The major objective of the Department is to provide in-depth understanding of the physical, social, and psychological determinants of health at various stages of the human life cycle and to promote application of this knowledge in health programs. Specifically, the curriculum emphasizes:

1. the developing individual and his or her changing physical, psychological, social, and cognitive strengths from conception to senescence within the context of family and community;
2. the examination of those health, welfare and related services which are currently available and those which could be instituted to meet the health needs of individuals, including those with chronic illness, handicapping or other special conditions;
3. the roles of governmental bodies, health agencies, voluntary and consumer groups in the organization and delivery of health and social services at all levels, e.g., international, national, state and local;
4. the interface of law with health and related systems which has varied implications for service and research at different stages of life;
5. the skills in policy formulation, planning, managing and evaluating of MCHA programs.

Research

The research of the Department involves a broad range of interests. The Longitudinal Studies of Child Health and Development started in 1930 have been expanded to investigate the patterns of growth, maturation and be-



Dr. Valadian's seminar group discussing child growth and development.

havioral, social and nutritional changes in an aging cohort. The availability of repeated measures collected over many years on the same cohort has facilitated the study of variables influencing health status at various stages of life and in relating adult health to child health and development. Investigation of patterns of physical and behavioral development during childhood and adolescence have particular emphasis on the development of statistical methods for analyzing processes of growth and development, and the utilization of these methods in health program planning and evaluation.

The interface between health and social well-being is a major concern of the Department. A community-wide survey is being conducted to ascertain the availability and the utilization of child health services in western Massachusetts. Another study involving an intervention to reduce the occurrence of self-destructive or suicidal behavior among adolescents is planned.

Doctoral students' research activities represent a range of interests in the areas of health, development, and service delivery. The adolescent determinants of adult gynecologic health, the physical and psychological status of children with Downs Syndrome, the development of scoliosis, the determinants of recidivism in child abuse and the evaluation of programs for pregnant adolescents form the basis of recently completed or in-progress doctoral studies.

Projected research endeavors by departmental faculty and students include a study of neurological and cognitive sequelae of early infancy apnea; an investigation of the side effects of marital separation on school-aged children; an assessment of developmental intervention of high risk infants; and a survey of attitudes and careers of women physicians.

Admission

Professionals with advanced degrees from health disciplines (including medicine, dentistry, nursing, social work, nutrition, psychology, health education) and other related areas such as law, education and anthropology are eligible for the following degree programs:

The M.P.H. degree with concentration in MCH is a one-year program designed primarily for established health professionals who desire to broaden their knowledge of public health policy and strategies and their specific application to the area of maternal and child health. To be eligible for this degree, applicants must meet eligibility requirements specified by the general M.P.H. program and in addition must have had relevant prior experience in maternal and child health.

Candidates admitted to the M.P.H. program in MCH must fulfill the core curriculum of the M.P.H. program described on page 10 and must take a minimum of 12.5 credit units in MCH core courses offered by the Department: MCHA 101a, 210a, 203a, 204c,d and 209c. It is expected that all students in this program will take courses leading to an understanding of normative physical and cognitive development, of maternal and child health services and of the legislation supporting health and social services

in maternal and child health. Students who wish to be excused from courses covering such material may petition the Chairman of the Department who will judge their proficiency in the area and may grant specific course waivers. Students excused from certain courses will still be required to take a minimum of 12.5 credit units in other departmental offerings.

The Master of Science degree in Maternal and Child Health (S.M. in MCH) is designed for students who wish to focus in depth in maternal and child health. The department offers both a one-year (40 credits) and a two-year (80 credits) program.

Applicants eligible for the one-year program are established practitioners or researchers with at least a prior master degree in a related field (medicine, nursing, social work, education or anthropology). Applicants to the two-year program are those who have at least a master's degree in an unrelated field (statistics, journalism, law) and who have little relevant experience in maternal and child health. In exceptional circumstances, applicants with a prior baccalaureate degree only may also be accepted in the two-year master's program.

Candidates for the one-year master's program must fulfill at least 20 credit units in departmental offerings whereas candidates for the two-year program must fulfill at least 30 credit units in departmental offerings, including the core courses. At the discretion of the Chairman of the Department, courses offered by other parts of the University may, on occasion, be substituted to fulfill this requirement.

Applicants to the doctoral program in the Department are required to have a prior advanced degree in a health field related to maternal and child health. Such applicants are judged on the basis of past academic performance especially in the quantitative sciences, relevant experience, stated career goals, and interest in an area of research consonant with the goals of the Department and with the expertise of the departmental faculty.

Career Outlook

The master's degree prepares candidates for positions where they will be instrumental in initiating and reshaping public health practice at federal, state, and local levels assuming responsibility for advocating, formulating policies, organizing and administering health care services for women, children, youth and the aged. The doctoral program trains researchers and prepares professionals for academic positions.

A limited number of fellowships may be available to master's candidates who are U.S. citizens and in the area of maternal and child health.

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 105.

Child Growth and Development; Child Growth and Development II: Advanced Seminar; Child Growth and Development III: Factors Affecting Growth and Development; Primary Maternal and Child Health Care; Content of Maternal and Child Health Services; Programs and Issues in Maternal and Child Health Services; Research Approach to Growth, Development and Health of the Child; Maternal and Child Health in Developing Countries; Nutrition in Child Growth and Development; Rural Health Services; Social Services for Mothers and Children; An Introduction to Personality and Cognitive Development; Health Care of Women; The Elderly Person in the Health Care System; Tutorials; Field Study and Research.

In conjunction with other departments:

Child Development and Social Policy and Human Rights in Health.

Department of Microbiology

M. E. Essex, D.V.M, Ph.D., Professor of Microbiology and Chairman of the Department

Faculty

Professors Cairns and Nichols; Associate Professors Cerny, Falk and Haseltine; Assistant Professors Eardley, Eisenstadt, and Grant; and Lecturer Madoff

Teaching and Research Staff

Visiting Lecturers Cotter, Fiumara, Gilfillan, Grady, Herrmann, MacDonald, Modabber, Walsh, Werner, and Wright; Instructor Ferraro; Research Associates Azocar, Girard, and Sliski

Introduction

The Department of Microbiology is primarily involved with the biology, epidemiology, and immunology of infectious disease agents, especially viruses. Training programs leading to the Doctor of Science degree are emphasized but the Department also participates in the professional degree programs offered by the School, for those so interested. Doctoral training areas include basic and applied research in virology, immunology, cancer biology and medical microbiology.

A collegial atmosphere prevails among faculty and students, and students are encouraged to participate in the numerous seminar series and informal discussion groups the Harvard Medical Area has to offer. Coursework is available in several areas of microbiology, in biochemistry and cell biology at the Harvard Medical School, other schools within Harvard University, or at the Massachusetts Institute of Technology, in addition to the offerings of the Department and the School.

The Department also maintains a relationship with the Massachusetts State Laboratory Institute, and is involved in joint research efforts with some of our associates at that Institute. In addition to the above research programs, the Department is involved in the teaching of public health policy and planning, especially as it relates to infectious disease.

Degree

Doctor of Science in Microbiology, with specialization in a particular area. There are no programs leading to the Master of Science in Microbiology as the terminal degree.

Research

Some of the areas in which Department faculty are conducting research are: cellular and tumor immunology, cancer biology and epidemiology; immunodiagnosis, immunochemistry and biochemistry of respiratory and enteric viruses, environmental aspects of virology, and mutagenesis.

Program

Goals

To provide training in research leading to a doctoral degree in microbiology, with specialization in a particular area.



"Case Studies in the Epidemiology of Infectious Disease" stimulate an active discussion between Dr. Nichols and a student.

Curriculum

At the doctoral level, major emphasis is placed on research training in immunology, virology, cancer biology, and medical microbiology. Students are encouraged to develop strengths in related areas such as molecular biology and epidemiology.

During the first two years students take courses as required to establish a firm background in the appropriate areas. By the second year at the latest, the student should be introduced to laboratory research, and should be formulating a thesis proposal for evaluation. Each student is expected to demonstrate a proficiency in laboratory techniques and an ability to reason through a research problem before undertaking doctoral research. These skills can be obtained by participation in laboratory courses and laboratory tutorials, as well as departmental and interdepartmental student and faculty seminars. Faculty research collaboration is underway with several laboratories outside the Department, and student participation in these programs is also encouraged.

Doctoral students should select a specific research topic in one of the areas mentioned under *Research* soon after admission to the program. (See p. 17 for specific degree requirements.)

Admission

Prospective students should have a strong background in biology and chemistry. Previous training in microbiology, virology, and/or immunology is desirable but not necessary. Students are admitted who have a baccalaureate degree as well as those with graduate degrees.

Career Outlook

Our recent graduates have accepted research and/or teaching positions with public and private academic institutions, with governmental agencies such as National Institutes of Health and the Center for Disease Control and occasionally with private industry.

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 107.

Critiques of Current Literature on Infectious Diseases; Clinical Problems in Infectious Diseases; Immunologic Aspects of Infectious Diseases; Departmental Seminar; Intracellular Microorganisms Pathogenic for Man; Case Studies in the Epidemiology of Infectious Disease; Virology; Advanced Cancer Cell Biology; Tutorial Programs; and Research.

In conjunction with another department: Introduction to Cancer Biology.

Department of Nutrition

Robert P. Geyer, S.B., S.M., Ph.D., A.M. (hon.), Professor of Nutrition and Chairman of the Department

Faculty

Professors Antoniades, Bloch and Lown; Associate Professors Hayes, Herrera-Acena, and Thenen; Assistant Professors Franceschi, Lieberman, el Lozy, Mora, Owen, Verrier, Witschi; Lecturer Austin

Emeriti

Professors Hegsted and Stare

Teaching and Research Staff

Visiting Lecturers Gershoff and Samonds; Lecturers Huber and Nicolosi; Research Associates Ausman, Chu, DeSilva, Gallina, Goldberger, Graboys, Lew, Podrid, and Lynch; Consultants Cannon and McGandy; Assistants Bruno and Gallagher

Introduction

The Department of Nutrition provides training and research opportunities in the basic science and the applied areas of nutrition with orientation towards problems of contemporary public health importance, including cardiovascular disease, obesity, and diabetes. Other areas of nutrition concerning policy, planning, and applied interventions have been a long-standing interest of the Department, as have health problems related to nutrition in this country and in Central and South America, Africa, and Asia.

Degrees

Master and Doctor of Science in Nutrition; Master and Doctor of Public Health with concentration in Nutrition; Doctor of Science (with Epidemiology).

Research

The research of the Department involves various aspects of nutrition ranging from cell biology and metabolism to animal pathophysiology, clinical studies, and policy planning at domestic or international levels. At the molecular level are studies on the regulation of cell growth by hormonal growth factors obtained from human blood components and the synthesis and application of perfluorocarbons for blood replacement. Mechanisms of nutritional interactions with experimental obesity and effects of diet on lipoprotein metabolism, atherogenesis and diabetes are examples of nutritional biochemistry and pathophysiology studies in progress.

Extensive use is made of computers both in the mathematical modeling of growth and in interactive dietary analysis and counseling. Other areas of applied research include evaluation of nutrition programs and dietary methodology.

At the international level are projects concerning the effects of malnutrition on mortality, morbidity and mental and physical development. Research activities of the faculty are listed under the course number "NUT 350-368."

Programs

Goals

The Doctor of Science in Nutrition degree program is designed to train highly qualified individuals interested in laboratory-oriented approaches to solving nutrition and metabolic problems. By utilizing a number of scientific disciplines and engaging in appropriate research, students learn and use the latest techniques in biochemistry, physiology, and related fields. The research, whether basic or applied, is relevant to human health. The joint Doctor of Science degree in the Departments of Nutrition and Epidemiology furnishes thorough training in both of these disciplines, enabling graduates to apply sound epidemiological methods to an ever increasing number of important nutritional problems. Applicants interested in earning the Doctor of Public Health degree in an area dealing with nutrition should contact the Department for information.

Curriculum

Students in the M.P.H. program who concentrate in Nutrition are required to take Principles of Nutrition (NUT 201a,b), Departmental Seminars (NUT 204a,b,c,d) and at least one other course offered by the Department.

For the S.D. in Nutrition degree, students are required to take graduate level courses in biochemistry, physiology, epidemiology, and biostatistics in addition to the following Nutrition courses: Principles of Nutrition (NUT 201a,b), Nutrition Policy Formation and Program Operation (NUT 203c,d), Departmental Seminars (NUT 204a,b,c,d), Biochemistry and Physiology of Nutrition (NUT 205c,d), and Laboratory and Animal Research Techniques (NUT 206c,d). Electives pertinent to the student's interests and the doctoral program's requirements are also taken. Tutorial research is begun during the first year, and a thesis must be completed within the period prescribed by the School (see p. 18).

The requirements for the Dr.P.H. degree are the same as those given for the S.D. in Nutrition degree, but the candidate must hold a M.P.H. degree.

The joint S.D. degree in Nutrition and in Epidemiology requires the student to take the courses designated for the Doctor of Science programs in the respective departments. In addition to these courses, a minor field must also be selected that satisfies both departments. A satisfactory thesis dealing with nutrition and epidemiology must be submitted within the time limit set by the School.

Admission

The laboratory-oriented S.D. in Nutrition degree program may be entered at either the master's or the doctoral level. It is highly recommended that the latter route be selected even by students with only a bachelor's degree. The Department may in certain instances exercise its own determination as to which option should apply. An excellent background in chemistry, biology, nutrition, or some other relevant science discipline is necessary for



Dr. Albert Owen discussed "The Regulation of Amino Acid Uptake into Human Diploid Fibroblasts" at a seminar.

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 109.

Principles of Nutrition; Nutrition Policy Formation and Program Operation; Departmental Seminars; Biochemistry and Physiology of Nutrition; Laboratory and Animal Research Techniques; Nutritional Aspects of Human Disease; Food Science and Nutrition; Nutrition Problems of Less Developed Countries; Tutorial Programs; and Research.

In conjunction with other departments:

Nutrition in Child Growth and Development and Nutritional Epidemiology.

admission. Admission for the joint nutrition and epidemiology S.D. degree requires a strong background in biology and mathematics. Approval by both the Departments of Nutrition and Epidemiology is necessary. Applicants interested in this program should contact the Chairman of the Department of Nutrition before formally applying. Applicants for the Doctor of Public Health degree with emphasis in nutrition should communicate with the Department Chairman prior to filing an application.

Career Outlook

Some positions recent graduates have taken: food aid administrator in Gambia; local health clinic administrator; director of nutrition support service in a medical center; assistant professor of nutrition at a school of medicine; nutritionist for federal nutrition evaluation agency; nutrition educator for national Tunisian institute; community nutritionist for state health project; food analytical chemist for industrial firm; postdoctoral research fellows in medical centers and universities; nutritionist at a school of public health; and assistant professor of biochemistry at a university.

Department of Physiology

John B. Little, A.B., M.D., Professor of Radiobiology and Acting Chairman of the Department

Faculty

Professors Brain, Ferris, Hornig, Little, Mead, Monson, Peters, Tashjian, and Whittenberger; Associate Professors Amdur, Kennedy, D. E. Leith, Sorokin, Speizer, and Wegman; Assistant and Visiting Assistant Professors Baker, Banzett, Boden, Butler, Drazen, Eisenstadt, Ellenbecker, H. Feldman, Gehr, Greenlee, Keyserling, Loring, Reynolds, Rice, Richardson, Schonbrunn, Smith, Toscano, and Valberg; Lecturers Murphy, Ofner, and Snook

Teaching and Research Staff

Lecturers Arndt, Douglass, R. Feldman, Levy, and Storm; Research Associates Castile, Henson, Hoppin, Letz, Long, Nagasawa, J. Smith, Voelkel, and Zamansky; Visiting Lecturers Landrigan, Mintz, and Oliver; Consultant McGandy; Assistant Vetrovs

Introduction

The Department of Physiology has research and teaching activities which include physiology as a basic medical science, but which extend beyond pure physiology to encompass a broad spectrum of environmental and occupational health problems. The mechanisms of action and the adverse health effects of chemical and physical factors in occupational and community settings are typical problems that have been central to the Department's interests. Such research provides the basis for prevention and control; the problems are very complex and require the insights of many specialties. The faculty and staff of the Department reflect the multidisciplinary nature of the field and include physicians, physiologists, physicists, engineers, toxicologists, and specialists in radiobiology and occupational health. Students and research fellows come with similarly varied backgrounds.

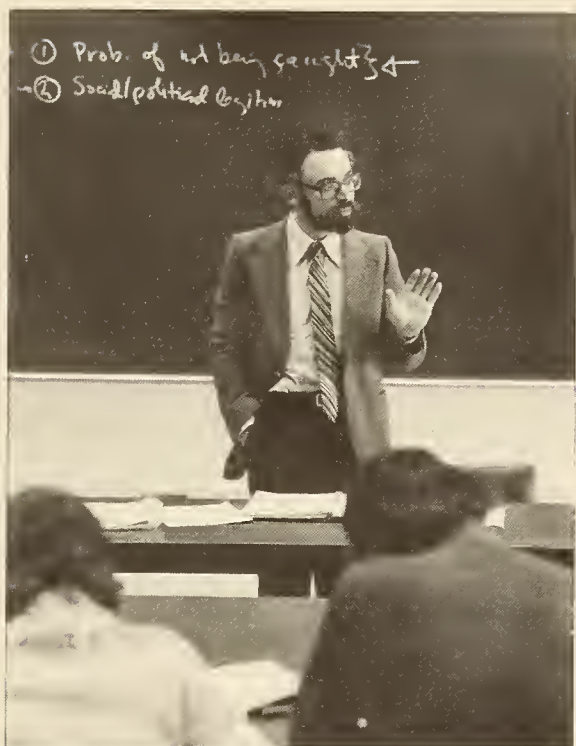
Major objectives of the Department are to provide students with basic information on human physiology and on the relationship of human beings to their physical and chemical environment. These concepts in biology and health are examined in detail in such courses as Human Physiology, Principles of Toxicology, Radiation Biology, and Basic Problems in Occupational Health and Industrial Environments. Specific research projects of members of the Department offer students an opportunity to gain experience in research and to develop a capacity for critical evaluation of research methods.

Degrees

Master and Doctor of Science in Physiology; Master and Doctor of Public Health; and Master of Occupational Health.

Research

The research programs include topics such as: cellular effects of ionizing radiation, mechanisms of carcinogenesis and mutagenesis, inhalation toxicology, comparative respiratory physiology, the deposition and clearance of particles in the respiratory tract, and epidemiologic studies of working



"Policy Issues in Occupational Health" is discussed by Dr. Boden.

populations and community populations exposed to various toxic materials. Other research areas are the mechanical properties of lungs and chest wall, development of pulmonary function tests and testing equipment, and application of these methods to the study of respiratory disease in occupational and community environments. The research and training programs in toxicology include the development and use of differentiated animal and human cell strains which perform organ-specific functions in culture as models for studies on the biochemical mechanisms of toxicant uptake and action as well as for the development of preventive or reparative interventions. Other research areas in toxicology include enzyme reaction mechanisms, mechanisms of tumor promotion, development of new analytic methodology, and behavioral toxicology.

Programs

Occupational Health

Information concerning programs and degrees in Occupational Medicine and Occupational Safety and Health may be found on p. 60 under Educational Resource Center for Occupational Safety and Health.

Pulmonary Biology

Goals

This program offers doctoral training in preparation for research careers in pulmonary biology. It is built on a public health viewpoint of the lung as a portal of entry and a target organ for environmental agents, and focuses on two aspects of organ system physiology: respiratory mechanics and respiratory defense mechanisms. Also emphasized are inhalation toxicology and the pathology of environmental and occupational lung disease. The biology is broadly based, ranging from molecular and cell biology to integrated organismic, environmental, and comparative physiology; both normal and pathological physiology are included.

Curriculum

Intensive course work in the first two years may include physiology, biochemistry, histology, engineering, toxicology, radiation biology, statistics, epidemiology, pathology, and immunology. The latter part of the program consists of research under the guidance of a faculty advisor. Collaborative research opportunities exist in several area institutions. (See p. 9 for specific degree requirements.)

Admission

Intended primarily for students with prior degrees in the physical sciences, or biology with a strong physical science and mathematical component. Two years of residence at the School are generally required to earn the S.M. degree; students with prior master's degrees in related areas may earn the S.M. degree in one year. Terminal master's degree programs are not ordinarily offered; students are expected to continue for the doctoral degree.

Information regarding the graduate program in pulmonary biology may be obtained by writing Professor Joseph D. Brain, Department of Physiology, 665 Huntington Avenue, Boston, MA 02115.

Career Outlook

Recent graduates and postdoctoral fellows have taken positions in academic, clinical, and government institutions doing basic and applied research and teaching in respiratory physiology and pathophysiology.

Radiobiology**Goals**

This program is designed to offer doctoral level training in the cellular and molecular effects of radiation in preparation for research careers in radiation biology and experimental carcinogenesis.

Curriculum

Course work during the first two years emphasizes biochemistry, cellular and molecular biology, virology and genetics, as well as the preparation needed to develop the basic skills in laboratory techniques and data handling necessary for undertaking original research. The latter part of the program involves intensive laboratory research under the guidance of a faculty advisor. Some areas of ongoing research in the program include the study of: the induction of mutations and malignant transformation in mammalian cells by low and high LET radiations and by chemical agents; radiation-induced DNA damage and repair processes at the cellular and molecular levels; cytogenetic effects of radiation and chemical pollutants; and the effects of radiation in human diploid cells from cancer-prone patients. (See p. 9 for specific degree requirements.)

Admission

Admission requirements include an appropriate background in biology, chemistry or physics. Although students are usually admitted into the master's program, they are expected to continue for the doctoral degree. A terminal master's program as such is not usually offered. Some students with prior master's or professional degrees, or with an unusually strong background in biology, may be admitted directly into the doctoral program.

Information regarding the graduate program in radiobiology may be obtained by writing Professor John B. Little, Laboratory of Radiobiology, 665 Huntington Avenue, Boston, MA 02115. A personal interview is strongly encouraged.

Career Outlook

After a period of postdoctoral fellowship, recent graduates of the program have primarily entered academic careers as university-based independent research scientists. Several graduates have entered governmental service or industry.

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 110.

Human Physiology; Principles of Toxicology; Pulmonary Cell Biology; Radiation Biology; Seminar in Toxicology; Advanced Toxicology; Evaluation of Occupational Health Problems; Structure and Function of the Mammalian Respiratory System; Tutorial Programs; and Research.

In conjunction with another department: Introduction to Cancer Biology.

Toxicology

Goals

The research and training program in toxicology provides students with knowledge of the health implications of environmental chemicals, their interactions with a variety of cellular systems, biochemical mechanisms of cellular toxicity, the means to identify toxic environmental chemicals and to prevent or reverse adverse effects where possible.

Curriculum

The predoctoral program in toxicology is undertaken jointly with the doctoral training program of the Department of Pharmacology, a part of the Division of Medical Sciences at Harvard Medical School.

The first year is usually devoted to course work. Courses are taken within the Division, at the School of Public Health, at Harvard University in Cambridge or at M.I.T. Students are expected to pass qualifying examinations before the end of the third semester. Thesis research to qualify for the Ph.D. degree should be completed in a total of four to five years in residence. The Ph.D. degree is granted by the Faculty of Arts and Sciences in Harvard University.

Admission

Students are admitted as candidates for the doctoral degree only.

Students should have knowledge of organic, physical, and biological chemistry, general biology, physics and calculus. Deficiencies might be made up in the summer before entering the program. There is no language requirement. A personal interview is strongly encouraged. The Graduate Record Examination is required.

Information regarding the graduate program in toxicology may be obtained by writing Professor Armen H. Tashjian, Jr., Laboratory of Toxicology, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115. Applications are processed through the Admissions Office of the Graduate School of Arts and Sciences.

Career Outlook

Upon receipt of the doctoral degree, it is expected that most students will take a period of postdoctoral fellowship training prior to entering a career in research in an academic institution, in government or industry.

Department of Population Sciences

David E. Bell, A.B., A.M., Clarence James Gamble Professor of Population Sciences and International Health and Chairman of the Department.

Faculty

Professors and Senior Lecturer Alonso, Dyck, Harrington, Keyfitz, Levins, Lewontin, Salhanick, and Wyon; Associate Professor and Visiting Associate Professors R. Repetto, Chen, and Lane; Assistant Professors Berggren and Ewbank; Lecturers Frisch and Hareven

Teaching and Research Staff

Lecturers and Visiting Lecturers Guerrero and McIntosh; Research Associates Holtrop, Morison, Puccia, Seeley, and Whipple; Consultants Gamble, Goldstein, and C. Thomas

Introduction

Acting under the conviction that rapid population growth was thwarting efforts to provide better housing, education, nutrition, health services, and medical care, and that the disparity between rates of population increase and rates of development of human and economic resources is a crucial problem confronting society, the School of Public Health established the Department of Demography and Human Ecology in 1962 (renamed the Department of Population Sciences in 1969) and the Center for Population Studies in 1964. As the view of the role of population change in health and welfare has matured, increasing attention has been given to questions of the broader interrelations between population structure, health and welfare, and social change.

Degrees

Master and Doctor of Public Health with concentration in Population Sciences; and Master and Doctor of Science in Population Sciences.

Research

Some research activities of the Department are: working toward a better understanding of the biochemical and endocrinologic mechanisms controlling fertility; studying the long-term impact of demographic changes within the United States; examining the interactions of fertility, income distribution and other aspects of socio-economic development; pursuing research applied to aspects of family planning and the interactions of fertility, nutrition and infectious diseases; continuing studies leading to community diagnosis of causes of rates of birth, death and migrations; studying biological aspects of population programs; studies of ethical aspects of population policies and programs; analyzing data collected in field studies in Haiti, including studies of mortality, morbidity, nutrition status, fertility and impact of programs; examining factors that might improve food production; and mathematical and experimental study of human ecosystems.



Dr. Paul Kwong presented statistics on China to his class last year.

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 112.

Introduction to Population Sciences; Introductory Seminar on Population Sciences; Student Project Design Seminar; Basic Demographic Methods for Developing Countries: Mortality and Fertility; Biological Basis for Fertility Control; Essentials of Human Reproduction; Applied Mathematical Demography; The Spatial Aspects of Societies; Foundations of Agricultural Sciences; Population Biology; An Economic Approach to Population Policy; The Biological Determinants of Fecundity, Environmental Factors, and Population Growth; Comparative Analysis of Public Policies in Developing Countries; Introduction to Community Diagnosis of Birth and Death Rates in Developing Countries; Human Ecology; Demographic Variables in Environmental Policy; Applied Mathematical Demography Seminar; Case Studies in the Design and Management of Population and Health Programs; Tutorial Programs; Field Studies; and Research.

Programs

Goals

There is wide variability among the programs of individual candidates, reflecting the diversity of the students' background, national origins, previous education, areas of professional concern, and career goals. Given these varied curriculum needs, the overall goals of the program are to develop sophistication in data and information management and evaluation, as well as to provide a broad philosophical perspective on problems and issues in the population field and on related issues of health and health care.

Curriculum

Faculty affiliated with the Department are specialists in demography, ethics, epidemiology, economics, sociology, ecology, genetics, business, psychology, and medicine. The formal courses and the tutorial instruction of the Department are planned to prepare students for effective participation in population programs as administrators, research workers, or educators. Programs of study are offered in these areas: population, health, and nutrition; the design, management, and evaluation of population programs; the analysis of complex ecological systems; demographic analyses; and reproductive biomedicine. Although the Department offers a very flexible program, approximately half of the S.M. students are from or are primarily interested in health and population problems of underdeveloped countries. (Please refer to p. 9 for specific degree requirements.)

Admission

Students with bachelor's degrees in biological and/or social sciences, or in other population-related fields, are generally expected to spend two years in residence toward the S.M. degree. Students with prior master's or higher degrees, or extensive work experience, generally complete study toward the S.M. degree in one year. Approximately one-fourth of those who complete the S.M. degree enter the doctoral program.

Career Outlook

Some positions recent graduates have taken: director of a university center for population studies; principal statistician; executive secretary of an international committee on applied research in population; president of a medical services consultants group; medical director of a planned parenthood association; director of a medical clinic; a programme officer for U.N. Fund for Population Activities; a UNFPA coordinator; a population intern for USAID; and an associate programme officer in Health and Nutrition for UNICEF.

Department of Sanitary Engineering

Faculty

Harold A. Thomas, Jr., S.B., S.M., S.D., Gordon McKay Professor of Civil and Sanitary Engineering; J. Carrell Morris, S.B., A.M., Ph.D., A.M. (hon.), Gordon McKay Professor of Sanitary Engineering; Joseph J. Harrington, B.C.E., A.M., Ph.D., Professor of Environmental Health Engineering in the Faculty of Public Health and Gordon McKay Professor of Environmental Engineering in the Faculty of Arts and Sciences

Introduction

Members of the Department participate in the School of Public Health through teaching interdepartmental courses such as *Principles of Environmental Health* and *Environmental Health Evaluation and Management*. The courses listed are offered in the Division of Applied Sciences of the Graduate School of Arts and Sciences. Graduates of engineering colleges or scientific schools may be admitted to the Division as candidates for degrees in the Graduate School of Arts and Sciences. They may elect appropriate courses in the School of Public Health as part of the program for these degrees.

Further information can be obtained by writing to the Committee on Admissions, Graduate School of Arts and Sciences, Holyoke Center, 75 Mt. Auburn Street, Cambridge, Massachusetts 02138.

Degrees

Graduate School of Arts and Sciences: Master of Science; Master of Engineering; and Doctor of Philosophy.

Research

Department members and other faculty from the Division of Applied Sciences are studying a variety of environmental problems:

Oil pollution in the Sargasso Sea; sources, occurrence and fate of toxic organic substances in natural waters.

Microbiological control of schistosomiasis; biological control of marine fouling.

Robust statistical estimation of frequencies of large floods and severe droughts; computer and systems models in fluid management of severely burned patients.

Large-scale agricultural planning models in Pakistan and India; avoidance of waste production in Brazil and other developing countries by choosing alternative flowsheets.

Some of the courses offered by the Division of Applied Sciences are listed below. The corresponding descriptions are on p. 115.

Chemistry of the Aqueous Environment; Hydrologic Cycles; Introduction to Environmental Microbiology; Introduction to Environmental Engineering; and Seminar: Technology Choice in Water Resources Development.

Design of Water Resource Systems; Stochastic Processes in Environmental Engineering; Seminar: Models for Environmental Systems Planning; Engineering Systems for Environmental Control; Water Quality and Its Management; Water Pollution Microbiology; Chemical Models of Natural and Polluted Waters; and Treatment of Water Supplies and Wastewaters.

Department of Tropical Public Health

John R. David, A.B., M.D., A.M. (hon.), John LaPorte Given Professor of Tropical Public Health and Chairman of the Department.

Faculty

Professors Chernin, Pan, Spielman, and Weller; Associate Professor Michelson; Assistant Professors Boyer and Hoff; Lecturer Cash

Teaching and Research Staff

Lecturers and Visiting Lecturers Dammin, Fendall, Foege, Hopkins, Kaiser, Mata, Moschella, Most, Mott, Neva, Popenoe, Scrimshaw, Sencer, and von Lichtenberg; Research Associates Cicconi, Maguire, Piesman, and Todd; Assistant Wheeldon

Introduction

The health problems of the tropical regions, as in all poorly sanitated areas, are predominantly of an infectious and nutritional nature. The infectious diseases are the primary concern of the Department of Tropical Public Health, with emphasis given to protozoal, helminthic, and viral entities and to relevant arthropod and molluscan intermediate hosts. Within the framework of the Center for the Prevention of Infectious Diseases, the Department of Tropical Public Health shares with the Department of Microbiology the responsibility for an integrated presentation of information on important infectious agents.

The basic course, Tropical Public Health 201a, is designed to provide students in the Master of Public Health program with knowledge regarding major parasitic diseases, and with factual information concerning the epidemiology and control of selected entities of public health importance.

The resolution of the health problems of tropical areas requires a multidisciplinary approach involving a considered appraisal of human resources as well as of relevant social, economic, and political factors. Thus, the student concentrating in the Department in preparation for a career in the field of international health should, in addition to departmental courses, acquire a broadened experience by elective work in other areas.

Degrees

Master and Doctor of Public Health with concentration in Tropical Public Health; and Master and Doctor of Science in Tropical Public Health.

Research

The investigative program in the Department currently deals with pathogens ranging from viruses to helminths. Studies on the *in vitro* cultivation and the physiology and immunology of a wide variety of agents are in progress. Biological investigations on the molluscan vectors of the schistosomes comprise another area of major interest. Facilities are available for the training of a limited number of students at the Doctor of Public Health or Doctor of Science level. The doctoral degree applicant should, if possible, obtain the necessary medical science background prior to enrollment. Collaborative arrangements established with institutions in the tropics provide diversified opportunities for study and research overseas.

Programs

Tropical Public Health

Goals

The program has the following goals: (1) to provide students who have adequate training in the health sciences with the additional background essential for careers in research or service in developing countries; (2) to introduce students to the significance, recognition, and prevention of the major infectious disease problems of developing countries; and (3) to introduce them to the factors influencing human ecology and social development in such areas.

Curriculum

Students are required to fulfill the distribution requirements for an M.P.H. program (see p. 9) and to take specific specialized courses offered by the Department; the nature of the specialized course work will depend on the interest of the candidate.

Admission

The one-year M.P.H. degree program is designed for persons with prior medical degrees (M.D., D.V.M., D.M.D., D.D.S.) or doctoral degrees in biomedical science who are interested in problems of infectious disease in developing countries.

Career Outlook

Graduates customarily direct programs dealing with the control of tropical diseases or with research on these entities. Posts are in the public or private sector and at the national and international level. A separate career opportunity involves academic work in the area of preventive and social medicine with emphasis on the problems of the developing areas of the world.

Medical and Public Health Parasitology

Goals

The goals of the program are: (1) to acquaint the student with recent advances in the area of parasitic diseases and with the present status of such diseases throughout the world; (2) to develop skills for evaluation of the current literature and of control programs; and (3) to provide adequate background for conducting research on these diseases, including their biochemical and immunological aspects. The master's program is regarded as preparation for doctoral study.

Curriculum

All students must satisfy basic course requirements in biostatistics, epidemiology, and tropical public health. Students usually take advanced course work in one or more of those disciplines, and also elect courses in health services, environmental health sciences, microbiology, and population sciences, etc., according to their interests. Students commonly cross-register for courses in the Harvard Medical School (e.g., immunology, pathology), the Harvard Graduate School of Arts and Sciences, and at M.I.T. Some of the elective work within the Department of Tropical Public

Some of the courses that the Department offers are listed below. The corresponding descriptions are on p. 116.

Ecology, Epidemiology, and Control of Important Parasitic and Viral Diseases of Developing Countries; Perspectives in Tropical Health: The Background for Decision Analysis; Techniques for Investigation of Parasitic Infections; Clinical and Pathologic Features of Tropical Diseases; Principles of Vector Biology: Epidemiology and Control of Schistosomiasis; Current Problems in Malaria; Introduction to the Immunology of Parasitic Diseases; Tutorial Programs; and Research.

Health may take the form of tutorials, laboratory research projects, or both. (See p. 14 for specific degree requirements.)

Admission

Students with prior M.D. degrees or doctoral or master's degrees in biological or medical sciences are eligible for admission to this program. The exceptional candidate with a strong biological background but lacking a master's degree will be considered. For the student without prior preparation in pathology, biochemistry, and immunology, two years of course work are customarily required before the S.M. degree is awarded; students with sufficient prior preparation may earn the master's degree in one year. The majority of students go on to earn the S.D. degree and enter careers in research and teaching in the area of medical parasitology.

Career Outlook

Graduates are prepared to pursue academic or administrative careers that deal with the important parasitic diseases of man.

Ecology and Control of Vectors of Disease

Goals

The specific educational goals of the program are: (1) to acquaint the student with the various arthropod and molluscan vectors of disease and to develop an appreciation of the biology of these organisms and the means for their control; (2) to prepare the student to plan and evaluate control programs; and (3) to develop skills with respect to identification, maintenance, and experimental procedures involving these organisms.

Curriculum

In addition to required courses in epidemiology and biostatistics, participants in the program will take courses in vector biology, entomology, malacology, parasitology and microbiology. Depending upon the particular interests of each student, courses in cell biology, invertebrate physiology, pathology, genetics, population ecology and computer sciences may be required. Each participant will conduct a program of original research. (See p. 14 for specific degree requirements.)

Admission

Students admitted to this program normally have prior medical degrees or doctorates or master's degrees in biological or medical sciences. Most students take two years to earn the S.M. degree, although some students with previous education in relevant areas may earn the degree in one year. Almost all recipients of the master's degree continue on for the doctorate, in preparation for careers in teaching and research.

Career Outlook

The primary goal of this program is to train vector biologists for careers in teaching and research in universities and in governmental and international agencies. Graduates are expected to occupy key positions in programs directed toward investigation and controlling vector-borne disease. International health is emphasized. Thus, graduates of the program may engage in basic biological studies and in operational research.

Centers, Offices, and Special Programs

Center for the Analysis of Health Practices

Efforts to promote equity of access or to improve the quality of health care have often had unexpected, and occasionally adverse, effects on the economy, legal institutions, and even on the effectiveness and efficiency of medical care itself. These complex and poorly understood ramifications of choices in the field of health suggest that decisions ought no longer to be considered the province of any single discipline, and that the study of many problems ought not to be left to the chance association of appropriate experts.

The Center for the Analysis of Health Practices (CAHP) represents one of Harvard University's responses to these needs. Based in the School of Public Health, CAHP provides a focus for the research activities of members drawn from the Faculties of Medicine, Government, Law, and Arts and Sciences, and the Departments of Health Policy and Management and Biostatistics of the School of Public Health. Members of the Center include some 25 physicians, economists, policy analysts, statisticians, sociologists, engineers, and systems analysts who are engaged in collaborative research dealing with the application of new technology to health care, medical economics, and the evaluation of medical interventions and primary care. In each of these subject areas, the investigative approach is directed at issues of efficacy, cost-effectiveness and public policy. In order to carry out its research agenda, CAHP has established collaborative relationships with most of the major teaching hospitals affiliated with Harvard Medical School, other providers of health care, insurance companies, and agencies of local, state and federal governments.

The research output of the Center appears in books, monographs, serial publications, discussion papers and, for a more general audience, in a quarterly *Newsletter* distributed to more than 5,000 individuals in government, business, insurance companies, state medical and hospital associations, medical schools and universities, and provider institutions.

The Center offers a variety of means for students to participate in its activities. Students whose dissertations concern issues in the health sector may wish to use the Center as a resource during the development of their theses. Alternatively, a limited number of students may find opportunities to participate in Center-sponsored research projects during the period of their enrollment in the University.

Students and faculty members who do not have a formal relationship to the Center may remain aware of the research activities of its members by attending the weekly "brown bag" workshops which serve as the major vehicle for communication among the members of the Center and their collaborators. These working seminars provide an opportunity for the discussion of potential projects, methodologic problems, or projects in progress.

Inquiries about programs or activities of the Center should be directed to its staff. The Director is Howard S. Frazier, M.D.; Associate Directors are Peter Braun, M.D., Herbert Sherman, D.E.E., and Eleanor Druckman, M.S.

Center for Population Studies

The Center for Population Studies was established in 1964 under the leadership of the School of Public Health, as a university-wide Center to join scholars and scientists in different fields in a common approach to human population problems. The members and research associates of the Center are drawn from the Departments of Biology, Economics, Government, and Sociology; the Division of Applied Sciences; and the Schools of Public Health, Design, Education, Medicine, and Divinity. The Center is located at 9 Bow Street, Cambridge.

In the School of Public Health, the Department of Population Sciences welcomes qualified candidates for the various degrees offered by the School. Courses open to all qualified students are also given by members of the Center in the Department of General Education and in the other parts of the University listed above.

The present research programs of the Center and the Department focus on several themes: laboratory and clinical research programs in human reproductive biology; economic, social, and environmental determinants and consequences of population change in America and other developed and developing countries, including public health aspects of fertility and the balance between populations and their resources; problems of urbanization and internal migration in both developed and developing countries; theories of population kinematics and dynamics and their implications for public policy; political and ethical aspects of population policy; historical population studies; population education; and adolescent growth and menarche.

Center for the Prevention of Infectious Diseases

The Center for the Prevention of Infectious Diseases comprises the Departments of Microbiology and Tropical Public Health. Working in close collaboration, the staffs of the two Departments are concerned with the broad spectrum of agents that parasitize man and with their relevant arthropod and molluscan vectors.

On a global basis the infectious diseases remain a primary cause of mortality. In the developed areas of the world, morbidity attributable to infectious diseases persists as a major impediment to the enjoyment of health. An increasing number of chronic degenerative diseases are recognized as stemming from the insults of prior infectious processes. In many societies, acceptance of the concept of population control awaits containment of undue mortality induced by the infectious diseases and the consequent assurance that children who are born will have a reasonable prospect of achieving maturity. Considerations such as the foregoing emphasize the continuing need for the public health expert to possess knowledge of the rapidly changing technology of the control of infectious diseases, as well as basic knowledge concerning the attributes and epidemiologic characteristics of the responsible agents.

The faculty of the Center for the Prevention of Infectious Diseases work together to discharge a common responsibility for multidisciplinary instruction in the various facets of diseases of infectious etiology. The formal course offerings of the two Departments are designed and scheduled to permit the acquisition of a broad basic knowledge of infectious diseases as well as an introduction to specialized subject areas. For qualified advanced students, concentration in specific areas with participation in collaborative or individual research is encouraged at both predoctoral and postdoctoral levels. The wide variety of current research projects in the Center permits acquisition of experience both at home and abroad, in the laboratory or in the field.

The Kresge Center for Environmental Health

This Center includes the Departments of Environmental Health Sciences, Physiology, and Sanitary Engineering and serves as a focus for environmental health and occupational health activities within the School of Public Health. Full-time faculty within the Center are physicians, engineers, physiologists, mathematicians, toxicologists, chemists, physicists, and other professionals. This diversity enables the staff to deal effectively with environmental and occupational health problems which require a multidisciplinary approach.

Specific categories in which the Center conducts research and training include:

1. Occupational health and safety
2. Air pollution health effects and control
3. Environmental toxicology (inhalation toxicology)
4. Radiation biology
5. Radiological health (radiation protection)
6. Respiratory biology
7. Environmental health engineering
8. Environmental health management

Degree programs include the Master of Public Health, Master of Science, Master of Occupational Health, Doctor of Science, and Doctor of Public Health. Formal requirements for each of these degrees are outlined in other sections of the catalog. Students interested in any of the above areas ordinarily enroll in the School of Public Health. Students whose primary interest is in problems of water quality and water resources generally enroll in the Division of Applied Sciences of the Graduate School of Arts and Sciences.

The Director of the Kresge Center is James L. Whittenberger, M.D. The Associate Director is Dade W. Moeller, Ph.D.

Educational Resource Center for Occupational Safety and Health

The overall objective of the Educational Resource Center is to train professionals who will be involved in preventing occupational disease and injury. Employment opportunities exist in universities, governmental agencies, industry, and labor. The training programs are currently supported by a grant from the National Institute of Occupational Safety and Health. This grant provides tuition and stipend support to qualified individuals on a competitive basis. College-level inorganic and organic chemistry are required for entrance unless specific exception is made. Applicants presently holding positions in the fields of occupational safety and health who plan to return to those positions are considered particularly strong candidates for admission. For further information about any aspects of the five educational programs listed below, contact the Director of the Occupational Health Program, 665 Huntington Avenue, Boston, MA 02115. Formal requirements for the degrees are on pp. 9-18.

Occupational Medicine

The program in occupational medicine consists of two years of training in the public health disciplines relevant to the prevention and control of occupational disease and injury. Upon completion of this residency program, physicians are eligible for certification by the American Board of Preventive Medicine (Occupational Medicine). The first year is primarily didactic and leads to the Master of Science in Physiology or Master of Occupational Health degree. The basic course requirements are listed under the Master of Occupational Health degree. The second year consists of applying the skills learned during the first year to problem solving and research. Field experience includes participation in health hazard evaluations with faculty supervision; clinical rotations in which individual patients are evaluated; and the design, execution, and analysis of data for a short-term research project. Specific placements are arranged in which residents participate in occupational health programs in industry, government, or labor unions. Applicants must have had one year of clinical training; certification by the American Board of Internal Medicine is recommended.

Industrial Hygiene and Occupational Safety

The two-year master's programs in industrial hygiene and occupational safety are designed to help meet the demand for professional personnel with the skills and scientific knowledge needed to identify and control health problems that exist in the workplace. The core curriculum includes recommended and required courses dealing with basic problems in occupational health and industrial environments, environmental control, safety science, identification and measurement of air contaminants, air and gas cleaning, principles of toxicology, biomechanics and work physiology, and aerosol technology.

Students specializing in industrial hygiene normally undertake internships and research projects dealing with toxic substances, noise, radiation, and heat stress. Those specializing in occupational safety normally undertake internships and projects dealing with physical hazards or work methods that cause traumatic or cumulative injury. Students graduating from either program will obtain the skills required to handle the broad range of environmental hazards which exist in the workplace.

Candidates for the programs normally have a baccalaureate degree in engineering, chemistry, physics, or biology. Those with master's degrees in the above disciplines or prior training or experience in related areas may be able to earn the Master of Science in Environmental Health Sciences degree in one year.

Occupational Safety and Health

Individuals with a baccalaureate degree and with advanced training in social or natural sciences may gain admission to a Master of Science in Physiology degree program in occupational safety and health. The program can emphasize either the epidemiologic or policy aspects of occupational safety and health. This is generally a two-year degree program, although an individual with a Ph.D. or J.D. degree may complete the program in one year.

Occupational Health Nursing

A two-year master's degree program for nurses with previous baccalaureate degrees in nursing is offered in collaboration with Boston University School of Nursing. The first year consists of didactic training in occupational safety and health at Harvard; the second year consists of graduate training in nursing aspects of occupational safety and health at Boston University. The Master of Science degree is granted by Boston University. Applications should be submitted to the Graduate Admissions Office, Boston University School of Nursing, 635 Commonwealth Avenue, Boston, MA 02215.

Office of Health Policy Information

The Office of Health Policy Information is a resource center for journalists, government officials and others, designed to facilitate access to the University's wide-ranging resources in health policy analysis and research. It provides a mechanism for synthesizing and communicating available information in a manner that is timely and relevant to the needs of journalists, legislators, academic, corporate and labor leaders, and others involved in the consideration of health policy matters. The chief aim of the Office is to make a true public resource of the wealth of experience and information available within the University.

Current activities include the publication of a series of background reports analyzing health policy issues, a program of visiting fellowships for journalists, and a monthly colloquium series, the Health Policy Forum. The

Some of the courses with particular relevance to international health are listed below. (Refer to appropriate corresponding descriptions.)

ID 209 Health Services in Developing Countries; HPM-POP 262 Health Planning in Developing Countries; NUT 210 Nutrition Problems of Less Developed Countries; MCHA 206 Maternal and Child Health in Developing Countries; POP 216 Comparative Analysis of Public Policies in Developing Countries; POP-HPM 263 The Design and Management of Population Programs; TPH 201 Ecology, Epidemiology, and Control of Important Parasitic and Viral Diseases of Developing Areas.

reports are designed to keep key individuals abreast of important developments in health policy research and analysis. The fellowships provide distinguished medical and science reporters with the opportunity to spend six weeks in residence at the School while conducting intensive research. The Forum provides an opportunity for legislators, agency heads, health care providers, and corporate and labor leaders to discuss their views on health and science issues with an audience drawn from this state's academic, legal, political, consumer, health professional, corporate, and labor communities.

The Office of Health Policy Information is directed by Jay A. Winsten, Ph.D.

Office of International Health Programs

The Office of International Health Programs provides advice both to foreign and to American students with interests in international health in the selection of appropriate programs and courses, and coordinates activities within the School that are relevant to international health. The School provides opportunities for preparation for careers in teaching, research, and service in international health, with particular emphasis on problems of health in developing countries. The School does not offer degrees in international health *per se*, but in the various public health disciplines, adapted to meet the needs of international health students. Courses are available to provide general background and understanding of international issues, skills and knowledge of health policy, planning, program design and management, and the relevant aspects of infectious diseases, nutrition, maternal and child health, population, etc. Various programs within the School, in conjunction with related course offerings in other divisions of Harvard University and the Massachusetts Institute of Technology, offer students a broad background for future careers with international agencies, mission groups, philanthropic foundations, and foreign governmental and academic institutions. Cross-registration opportunities are available for students interested in medicine, economics, public administration, education, anthropology, government, social relations, and related subject areas appropriate to particular regions of the world. (Students may also cross-register for courses in foreign languages, but may not receive credit for such courses toward degrees being earned at the School).

Faculty members active in international health programs have had extensive experience in countries in Latin America and the Caribbean, Africa, Asia, and the Middle East. They are drawn from various departments and schools throughout the University, giving international health an interdepartmental and interdisciplinary orientation. Students at the School of Public Health come from more than 40 different countries, and usually represent the whole range of public health disciplines. The exchange of knowledge between students provides an additional dimension to the learning experience.

The Community Health Improvement Program

The Community Health Improvement Program is an off-campus community service component of the Harvard School of Public Health which complements established programs and courses at the institution. The objective of CHIP is to effect improvement in the health communities by developing, implementing and evaluating innovative, community-based public health strategies.

Students accepted in the program receive up to 5.0 credits per semester for their internships with community agencies. Paid summer placements also are available. The CHIP program addresses four particular areas: 1) environmental and occupational health, 2) housing, 3) nutrition, and 4) health services for low-income populations.

The service goals of CHIP are fulfilled by externs and by CHIP staff who may directly assist field personnel in problem-solving efforts aimed at improving the equity, efficiency and effectiveness of health service delivery systems, and improving the utility of policy-relevant information and evaluation techniques.

Finally, CHIP demonstration and research activities are guided by more general needs for new public health knowledge and understanding. These projects are developed by CHIP staff, faculty members who become associated with CHIP, and by doctoral students.

CHIP is currently operating in the fifth year of a renewable grant from the W. K. Kellogg Foundation. J. Larry Brown, Ph.D. is the Executive Director and Principal Investigator.

Continuing Education in Environmental Health

As part of its activities, the Department of Environmental Health Sciences offers a series of short-term technical courses covering a variety of specialty areas. Some of the courses are offered in cooperation with other groups within the School, most notably the Occupational Health Educational Resource Center, as well as with outside industrial organizations. At the present time, 20 to 25 short courses are presented annually within this program. The courses range from two days to two weeks in length, with the majority being of one-week duration. Essentially all of the courses are directed to topics in the fields of industrial hygiene, radiation protection, air pollution control and meteorology, and risk/benefit analysis. Individual topics include industrial hygiene practice, management of industrial hygiene problems, sampling and evaluation of airborne asbestos, occupational respiratory protection, spirometry, certification of biological safety cabinets, in-place filter testing, occupational and environmental radiation protection, planning for nuclear emergencies, environmental radiation surveillance, air pollution meteorology, and risk/benefit analysis for regulation of chemicals.

In many of the courses, outside experts are invited to serve as guest lecturers for the coverage of special topics. Many courses include laboratory

sessions during which participants can obtain practice in the use of the latest analytical apparatus and portable field measuring instruments. Classes are generally restricted to approximately 25 participants and laboratory sessions are conducted in small groups to assure adequate time for discussion and interaction with the faculty and staff. Each course carries Continuing Education Units and many have been approved for recertification credit by the American Board of Health Physics and the American Board of Industrial Hygiene. Participants include scientists, engineers, and environmental health specialists employed by federal, state and local regulatory and control agencies, and by industrial organizations, research and development laboratories, public utilities, consulting groups, and casualty insurance carriers. Currently, over 400 professional personnel annually attend the courses offered by the Department. Details on course schedules, tuition fees, and other aspects of the program may be obtained by contacting the Short Course Coordinator, Department of Environmental Health Sciences (telephone: 617: 732-1171).

Executive Programs in Health Policy and Management

Executive Programs in Health Policy and Management was established in 1974 to develop and conduct educational programs for executives engaged in management and regulation in the health and environmental fields. In 1979, Executive Programs was incorporated into the Department of Health Policy and Management. The programs are residential and range in length from three days to six weeks. The short programs focus on a specific topic or role, such as finance; the longer programs focus on management skills and policy analysis.

The programs are structured to bring together: an intensive, focused curriculum designed to develop managerial and analytical expertise; a multidisciplinary faculty experienced in executive education drawn from several professional schools at Harvard; participants with a wide range of personal and professional experience; an interactive learning climate requiring serious individual study and active contribution; and a full-time, residential experience promoting extensive exchange of insights among faculty and participants.

Participants in the programs are sponsored by their employer organizations: health care providers; federal, state and local government agencies in health and the environment; national, regional, and local planning and regulatory agencies; corporations; professional, trade, and public interest organizations; legislative committees; and fiscal intermediaries.

A core faculty is drawn from the Harvard School of Public Health; representatives from the Faculties of Business, Government, Law, and Arts and Sciences also teach in the programs. The programs are taught primarily by the case method, which requires the active involvement of the participants in the analysis of problem situations and the development of solutions to them.

The Programs offered in the last year have included: Health Systems Management; Health Policy, Planning and Regulation; Environmental Policy and Management; Chiefs of Clinical Services; Financial Management and Strategy in Health; Managing Multi-Institutional Collaboration; and Managing Small Institutions.

Participation in Executive Programs is applicable to the A.M.A.'s Physician Recognition Award Category I Credit.

Interdisciplinary Programs in Health

The primary objectives of Interdisciplinary Programs in Health (IPH) are to enlist scholars from the natural and social sciences in finding new ways to deal with the critical health problems of today's society and to attract and train for health fields young and midcareer people with strong backgrounds in a natural or social science.

IPH is designed to bring to health problems the knowledge, skills, insights and analytic techniques of a variety of disciplines. It is a University-wide program, based at the School of Public Health. Members of the Faculties of Arts and Sciences, the John F. Kennedy School of Government, Law, Medicine and Business participate in IPH.

IPH presently focuses on environmental health with particular emphasis on issues of both science and public policy related to chemicals in the environment.

Over 40,000 chemicals are currently in production and more than 500 additional ones are introduced each year, many of them biologically active. The problems raised by these chemicals provide the initial emphasis of IPH. The studies will range from laboratory studies of biochemical effects at the cellular level to risk assessments and policy analyses of the regulatory process. Individual programs will reflect the interests and wishes of participants.

It is expected that participants will leave IPH prepared to work on health problems in federal, state and local governments, in industry and in research and, in some instances, to launch programs at other universities.

It is not a degree granting program.

The Participants

IPH provides opportunities for:

1. Promising graduates of advanced degree programs in the natural or social sciences seeking preparation for careers in which their talents can be applied to health-related problems, either through fundamental or applied research or through service.
2. Senior scientists and scholars who have made significant contributions in a discipline and now wish to apply their discipline to health-related problems.

3. Individuals from government or industry who have been involved in problems of environmental health and regulation and wish to broaden their background and perspective.

In addition, IPH seeks to create new cooperative links among scholars within Harvard University as they work on problems relating their fields to applied health research.

The program has several components. First, research may be done individually, in collaboration with existing research groups, or with new interdisciplinary teams. Second, seminars and working groups will explore particular problems and develop papers and monographs. Third, Fellows and Visitors meet together regularly, joined by members of the Harvard faculty and distinguished guests, to exchange experiences and to discuss important issues related to health.

IPH Fellows

Postdoctoral fellowships will be awarded for terms of one or two years, as appropriate, and may be renewable for a third year.

Fellows will be chosen from the natural sciences (chemistry, biology, biochemistry, physics and mathematics), the quantitative analytic areas (statistics, operations research, engineering, computer science, etc.) and the social sciences (economics, sociology, public policy, law, management, etc.).

Those selected will devote their initial period to orientation, exploration of opportunities and selection of projects and advisors. Experimental facilities will be made available in the laboratories of existing research groups. It is expected that during the term of a Fellowship a substantial investigation or analysis will be completed.

For further information on admissions requirements, contact: Dr. Donald F. Hornig, Director.

Visiting Scientists and Scholars

Visitors may be on leave from universities, industry, or public interest organizations. If stipends are required from IPH they will be adjusted to individual circumstances and the availability of other support to the applicant. Applicants should submit a curriculum vitae, a list of publications, a proposal for research or study to be undertaken in IPH and a statement of the relation of IPH to their career objectives.

General Information

History of The Harvard School of Public Health

Professional education in public health had been steadily expanding in Harvard University for more than two decades before the actual founding of the School in 1922. Its gradual development was characterized by certain important steps, the first of which was the establishment, in 1909, of the Department of Preventive Medicine and Hygiene in the Medical School — the first such department in the United States. The degree of Doctor of Public Health was first conferred in 1911. In that year a Department of Sanitary Engineering was established in the Graduate School of Engineering. In 1913, the Department of Tropical Medicine and, in 1918, the Division of Industrial Hygiene, with clinical and laboratory facilities, were organized in the Harvard Medical School.

Also in 1913, the Harvard–Massachusetts Institute of Technology School for Health Officers was formed under the joint management of Harvard University and the Massachusetts Institute of Technology. This School operated until the fall of 1922, when it was superseded by the Harvard School of Public Health, made possible by an endowment for this purpose from the Rockefeller Foundation.

In the early years of the School's operation, several of its departments functioned as joint departments with counterparts in the Medical School, sharing facilities, faculty, and budgets. In 1946, the School was separated administratively and financially from the Medical School and became an autonomous unit of Harvard University. It continues to cooperate with the Medical School in teaching and research, and has also developed close associations with other divisions of the University, particularly the Graduate School of Arts and Sciences, the John F. Kennedy School of Government, and the Graduate School of Business Administration.

The School participates in both professional and graduate education, as well as mid-career education, and offers the degrees of Master and Doctor of Public Health, Master and Doctor of Science, and Master of Occupational Health.

Location and Resources

The main buildings of the School are the Health Sciences Laboratories at 665 Huntington Avenue, and the Sebastian S. Kresge Educational Facilities Building at 677 Huntington Avenue, Boston. These buildings are near the Harvard Medical and Dental Schools; the Countway Library of Medicine; the Children's Hospital Medical Center; the Beth Israel Hospital; the Brigham and Women's Hospital; and other Harvard-affiliated hospitals. The School's Center for Population Studies has an office in Cambridge.

Health Sciences Computing Facility

Computing and data processing resources are available to students through the Health Sciences Computing Facility (HSCF), which is operated by the School of Public Health. A staff of computer programmers and analysts assists researchers and students from all of the Harvard Medical Area institutions in using the computer as a tool for analyzing data, for doing extensive numerical calculations, and for acquiring, maintaining, and processing large data bases.

HSCF is equipped with five computer systems, four of which are used interactively in a time-sharing mode and one which is used in a batch processing mode. Remote batch processing is accomplished by a high-speed telephone link to the ITTEL AS/7031 computer at the Harvard Computing Center in Cambridge. Remote interactive computing is provided by telephone links to computers at the Sidney Farber Cancer Institute, the Harvard Computing Center, the Massachusetts Institute of Technology, and Dartmouth College.

HSCF offers computing capability for School programs using a VAX 11/780 and a PDP 11/70, both running under the UNIX operating system, and a PDP 11/70 running under the MUMPS operating system. Over one hundred simultaneous users can be accommodated. Teleprinter and video terminals are located in the School to allow students to access any of these computers. Students also use an IBM batch processing system which features a number of statistical packages including SAS, SPSS, and BMDP. Languages available at HSCF include Basic, Fortran 77, PL/1, MUMPS, and C.

HSCF staff participate in several computing courses given by the Department of Biostatistics. In addition, HSCF offers short courses on specific languages, packages, and specialized medical and health data bases. Students who have had computing experience may enroll in special tutorials (Biostatistics 313a,b,c,d). The Director of the HSCF is Dr. Raymond K. Neff.

Libraries

The library needs of the School are served principally by the Francis A. Countway Library of Medicine, located at 10 Shattuck Street. The Countway Library combines the resources and services of the Harvard Medical Library and the Boston Medical Library. Among libraries serving medical and health-related schools, it is the largest in the country, with recorded holdings of more than 460,000 volumes and 4,800 periodicals. The Countway Library also has extensive collections of historical materials, dating from the fifteenth century. Its history of medicine department provides modern facilities for the use of these books and other rarities.

All members of the University may borrow from the Harvard College library at Cambridge. Messenger service is provided daily between the college library, various other Harvard University libraries, and the Countway Library. Some departments within the School also maintain their own libraries. The Boston Public Library, libraries of the Massachusetts Institute of Technology, and other libraries of the Boston area add to the total book and periodical resources available to students.



A library tour is part of the School's orientation program.



The Computing Facility is used extensively by students and faculty.

Other Resources

Students at the School may enroll in courses in other faculties and departments of Harvard University, e.g., in the natural sciences, public administration, economics and other social sciences, statistics, and medical sciences. Many graduate courses at the Massachusetts Institute of Technology and the Fletcher School of Law and Diplomacy at Tufts University are also open to students at the School. Students will generally be granted credit for such courses toward degrees being earned at the School of Public Health, with the exception of courses in foreign languages. Credit granted for cross-registered courses may not exceed one-half of the credit units required for the degree in question.

The School maintains a close association with a wide variety of health, medical care, and welfare organizations in Massachusetts and elsewhere. The facilities of hospitals and certain other institutions adjacent to the School are available to qualified students. Other local, national, and international health facilities provide opportunities for observation and special studies, and members of their staffs are available to assist in the School's educational program. The State Laboratory Institute of the Massachusetts Department of Public Health offers opportunities for qualified students to obtain experience in laboratory methods pertinent to public health.

Admission

Application for Admission

Application forms for admission to all degree programs and for special student status can be obtained from the Admissions Office, Harvard School of Public Health, Room G-4, 677 Huntington Avenue, Boston, MA 02115. Applications for admission are generally accepted for the fall term only because of the sequencing of courses.

Applicants must submit the following for consideration by the Committee on Admissions and Degrees: (1) a completed application form; (2) transcripts of academic records at college, graduate schools and/or professional schools, with official certification of degrees conferred; (3) letters of recommendation from at least three people who are well acquainted with the applicant's previous academic work and experience. In addition, the Graduate Record Examination must be taken within the last five years by certain applicants, as noted in the *Degree* section at the beginning of this *Register*. Applicants may apply to one degree program and one specialty area only.

An application fee of \$30, which is not refundable, must accompany the application in the form of a check drawn on a bank in the United States, a postal money order, or an international money order payable to the Harvard School of Public Health.

In addition to fulfilling the specific requirements for admission to a degree program, applicants must satisfy the Committee on Admissions and Degrees as to their ability to undertake advanced study at a graduate level. The final decision as to the admissibility of an applicant rests with the Committee.

Admitted applicants submit a \$100 tuition deposit when confirming admission. This deposit is credited to the fall term bill and is not refunded if the student fails to register.

The School is unable to accept all who are eligible for admission. Therefore, persons who wish to be considered for admission are urged to submit their applications by February 1 but no later than March 1 prior to the academic year in which they wish to enroll.

Admission of a candidate is for a particular year; if enrollment at that time is not possible, reapplication is necessary and will be considered on the same competitive basis as a new application. Exceptions to this must be approved by the Committee on Admissions and Degrees.

As a matter of policy, Harvard School of Public Health does not discriminate among applicants and students in admissions, educational policies, scholarship and loan programs, and athletic and other programs on the basis of race, religion, sex, national origin, color, creed, handicap, age, sexual orientation, marital or parental status, or status as a Vietnam era or disabled veteran. The School encourages women and members of minority groups to apply for admission. Increasing numbers of students with disabilities are enrolling at Harvard and are participating in a wide range of

programs and activities. Every effort will be made to meet special needs. There are, however, no separate academic programs for either the physically handicapped or for students with learning disabilities; all enrolled students undertake the same program. The Assistant Dean for Student Affairs has been designated to assist handicapped students and employees in adapting to life at the School.

Foreign Students

Language Proficiency

Applicants from countries in which the language of instruction is not English must satisfy the Committee on Admissions and Degrees as to their ability to speak, read, write, and understand the English language competently. Only students who have shown evidence of academic excellence and who can understand rapid, idiomatic English and can speak, write and read English with a high degree of facility should apply for admission. Students should be advised that they may be required to attend ten or more classes each week and to write papers and frequent short examinations. The School requires that all students maintain a minimum grade average of B- (grade point average 2.7) for graduation, and some departments and programs have more restrictive standards. No allowance is made for students whose English is not sufficient for these demands; therefore, any deficiency must be made up before admission. If a student completes all required coursework but does not have a grade point average (GPA) of 2.7, the student will not be permitted to receive a degree.

The School requires that foreign applicants obtain a satisfactory score (ordinarily 550 or better) on the Test of English as a Foreign Language (TOEFL). The test is administered four times a year at centers throughout the world. Applicants are advised to take this test as early as possible in the admissions process. Information concerning the test may be obtained by writing to the Test of English as a Foreign Language, Box 899, Princeton, New Jersey 08540. *Applications will not be considered without documentation of English proficiency satisfactory to the School.*

Financial Certification

The School has adopted the following policy regarding foreign nationals who are applying for admission from outside the United States. An applicant whose financial support is not guaranteed by an official U.S. agency or foundation must submit evidence satisfactory to the School that he or she will have sufficient funds available in U.S. currency to pay the expenses for the full period of his or her academic program, and that he or she is permitted to exchange or export these funds. Certification of adequate financial resources must be received by the School before the immigration form needed to obtain a visa to enter the United States can be issued. Foreign students who are wholly supported by personal funds will be required to have adequate funds to cover the cost of tuition in an escrow account in in a U.S. bank before the immigration form will be issued.

Foreign nationals admitted to the School and already residing within the United States will also be required to submit satisfactory evidence of

sufficient funds to cover their expenses for the full period of their academic program. Such students will not be permitted to register at the School unless they have adequate funds to cover the cost of tuition in an escrow account in a U.S. bank.

An estimate of living expenses in the Boston area may be found in the section entitled "Living Expenses" on p. 85.

Academic Credentials

Before foreign students are permitted to register, the School must receive official sealed transcripts of all academic records presented for admission. Photocopies of original transcripts or diplomas are accepted only if properly notarized by U.S. Consular officials.

Employment

Foreign students admitted to study programs at the School of Public Health who hold M.D. degrees and who will be holding either an F-1 or J-1 visa under the sponsorship of Harvard University will not be permitted to accept any employment for which an M.D. degree is a prerequisite while in this country under the sponsorship of the University.

J-2 work permits are not automatically granted for spouses of students. Spouses should not expect to receive such a permit during the first six months or even a full year after they enter the country.

Hospital Insurance

All nonimmigrant foreign students are required to enroll in the Harvard Blue Cross/Blue Shield student insurance plan. There can be no exceptions to this requirement. More information about the plan is included in the section entitled "Registration and Tuition" below.

All inquiries and communications regarding admission should be addressed to the Director of Admissions at the address given above.

Degree Candidates

Full Time

Credit units are assigned on the basis of the total amount of time required by a course, both in class and outside of class. Twenty credit units constitute a full program for one term, and a student must take a minimum of 40 credits for the year to be certified as full time. A full-time student may register for no more than 25 credit units per semester unless permission is obtained from the Committee on Admissions and Degrees.

Part Time

Students may register as part-time degree candidates with the approval of the Committee on Admissions and Degrees. Ordinarily this requires half-time attendance; however, full-time full tuition requirements for the degree must be met (see tuition and registration guidelines, p. 83). A one-year program may be completed in two academic years, a two-year program in three academic years. Ten credit units per term constitute a regular program for half-time students. Half-time students may register for no more than 12.5 credit units per term.

Requirements for Nondegree Status

Courtesy Students

Persons holding Harvard Corporation appointments are permitted to enroll in courses at the School with the permission of the instructor and the Registrar. Harvard employees should consult the Personnel Office about the provisions of the Harvard Tuition Assistance Plan. Employees from the Harvard teaching hospitals participating in tuition plans should consult the Registrar about the availability of space in courses of interest to them. Courtesy students may take a maximum of five credits per semester. In courses with restricted enrollment, preference is given to degree candidates.

Special Students

The School may accept a few students who are not degree candidates. Procedures and requirements for the admission of such students are the same as for degree candidates. Admission of special students to courses is subject to availability of space and the permission of the instructor. Candidates should specify on the application form the courses they plan to take. Admission as a special student carries with it no commitment to accept the applicant as a degree candidate and is limited to one academic year. Special students who wish to be admitted to degree candidacy must reapply and will be considered on the same basis as other applicants for admission. Special students are not admitted only to audit courses. Special student status is governed by the same policies that apply to all matriculated students, but those enrolled less than half time are restricted to courses at HSPH.

After admission to degree candidacy, students may petition the Committee on Admissions and Degrees to count toward academic requirements courses taken as a special student or courtesy student (i.e., while in non-degree status). Permission may be granted if the courses fit into the student's academic program. Tuition credit is not given for these courses, and students who are granted such permission must still meet the tuition requirements for the degree. (See p. 83 for tuition guidelines.)

Registration

General Information

The Academic Year

The academic year is divided into two terms. In the School of Public Health the fall term begins in mid-September and the spring term begins in late January or early February. Each term is divided into two periods: "a" and "b" in the fall term, and "c" and "d" in the spring term. Between the terms, in January, a week of field work and special projects is called "e" period. The *Academic Calendar* which gives term dates, recess periods, holidays, etc., is printed in the front of this *Register*.

Official Notices

It is important that each student keep informed of all official notices which are posted on the Office of the Registrar bulletin boards located on the G-Level of the Kresge Building.

Registration

Registration ordinarily occurs the week before the Monday on which fall term begins. Registration for new students in the spring term occurs on the Monday before the Wednesday when the term begins. Continuing students register in the spring term by filing their study cards by the appropriate deadlines given in the Academic Calendar. Late registration may be accomplished (with a late fee of \$10) up to the last day to register in a given term as specified in the Academic Calendar.

All foreign students who are registering at the School of Public Health must report to the Harvard International Office, Holyoke Center, 1350 Massachusetts Avenue, Cambridge, MA, at the beginning of each academic year or the beginning of the spring term if not registered for the preceding fall term. There they must present their passports and entry permits or other evidence of their immigration status. This requirement applies to all students who hold an F-1 student visa, a J-1 exchange visitor visa, or permanent resident status.

Every student who is a degree candidate is expected to register until the requirements for the degree are fulfilled or until degree candidacy is terminated. Every resident student, whether full time or part time, must register in person at the beginning of each term. Doctoral candidates doing advanced work may petition the Committee on Admissions and Degrees to register with nonresident status. Since nonresident status is ordinarily considered less than half time, students in this category automatically fall into loan repayment and must make special arrangements for continuation of health insurance, as they are not eligible for the regular Harvard plans. Foreign students who wish to study as nonresidents but within the U.S. may petition for full-time status in order to maintain visa requirements.

Each student must file in person a study form and course cards, approximately one and one-half weeks after the first day of classes. In the fall term, new students are given additional time to file. Students who sign up for courses listed both at HSPH and other faculties must register for the HSPH section. Before submitting study cards, a student should visit classes and consult with her/his advisor, who signs the study card, to decide on a definite program. Students who hand in late study cards will be charged a \$10 late fee.

Since the filing of study cards is considered an official part of registration for a term, failure to file a study card by the last day to file in that term may result in cancellation of registration.

Courses may be dropped from the schedule if not enough students are enrolled.

Petition to Change Courses

After a study card is filed, all changes in courses being taken for academic credit, whether within HSPH or by cross-registration, must be made by petition. Official drop/add forms include space to change grading options and are available in the Registrar's Office. A \$10 fee is charged for each petition filed regardless of the number of changes on a single petition. Changes cannot operate retroactively.

Cross-Registration

Students may take courses in other faculties of Harvard University, at the Massachusetts Institute of Technology and the Fletcher School of Law and Diplomacy at Tufts University. Students are advised that dates of deadlines for cross-registration and for beginning of classes vary from school to school (MIT, the Business School and Law School begin fall classes at least one week earlier than the School of Public Health), sometimes making it difficult to coordinate registrations. It is important to consider the desirability of cross-registration in light of two factors. First, that some schools pattern the length and activity of their classes much differently than the School of Public Health. At the Business School, for example, classes meet intensively for several hours at a time instead of meeting in several one- or two-hour sessions per week. This may interfere with a student's ability to attend classes at HSPH. Second, commuting time to all but the Medical School may be as long as 45 minutes each way in winter, so that a total commitment of three hours may be required merely to attend a one-hour class. A student should discuss desirability and feasibility of cross-registration with his/her advisor.

Credit granted for cross-registered courses may not exceed one-half of the credit units required for the degree program of the student. Detailed instructions and cross-registration petitions are available at the Registrar's Office. Petitions must be filed early in each term. Students should check instruction sheets and the calendar for deadlines. (*Note:* Students should avoid visiting the Registrar's Office in another faculty on the day of that School's initial registration.) HSPH students who drop C-R courses should do so by filing standard drop/add forms in the HSPH Registrar's Office by the deadline published by the appropriate faculty. Drops will not be accepted after such deadlines.

Grades for C-R courses are transferred from other faculties according to their grading systems and not those of HSPH. Individual instructors may not determine grading options for cross-registered students but must conform to their faculty's official regulations. Students who cross-register are bound by the rules and regulations of the respective faculties regarding grades, examination schedules, make-up examinations, and incomplete work. These regulations are often very different from those at HSPH, and students with questions should consult with the Registrar of the faculty involved. Degree candidates are urged to check the examination schedules of cross-registered courses to avoid possible problems of late reporting of grades to HSPH faculty for the degree lists. Some Law School courses, for

example, give examinations at so late a date that grade returns are not possible for HSPH degree candidates.

Undergraduate level courses taken by cross-registration may not be counted toward a degree at HSPH. Part-time special students at HSPH may not cross-register.

Tutorials

All tutorials receiving degree credit at HSPH must be taken with the permission, and under the supervision of an HSPH faculty member. Students file tutorial forms giving descriptions of the course content, hours required, and credit to be awarded when they file study plans. Students are expected to complete two hours of work per week throughout the term to receive one unit of credit.

Audited Courses

Courses may be audited at the discretion of an instructor. No credit is given and no audited courses appear on permanent records or transcripts. Some HSPH courses exclude auditors.

Radcliffe Seminars and Harvard Extension School Courses will not receive degree credit at HSPH.

Withdrawal and Leave of Absence

Students wishing to *withdraw* after a term has begun must notify the Registrar and their department in writing and schedule an exit interview with the Director of Financial Aid and the International Students' Office where appropriate.

Students wishing to take a *leave of absence* must file a petition using a form available in the Registrar's Office which is signed by the advisor and departmental chairman. The Committee on Admissions and Degrees ordinarily grants leaves of absence for a maximum of two terms.

Students planning to petition for a leave of absence should make an appointment with the Assistant Dean for Student Affairs.

Tuition is prorated according to the calendar dates published on page 82. The effective date of a withdrawal will be the date the letter of withdrawal is filed with the Registrar, or a future date, if so requested in the letter by the student. For students granted a leave of absence, tuition is charged to the end of the tuition period in which the student is granted the leave of absence. The deadlines for leaves and withdrawals from the School without becoming liable for payment of tuition are given in the Academic Calendar. A student who fails to register by the last day to register in a term will be automatically withdrawn unless a leave of absence has been approved. Students who withdraw must apply for re-admission. Students who withdraw after the last meeting of a class will be considered registered for the entire course and the grade will be recorded. Blue Cross-Blue Shield health payments may not be prorated but must be paid by the term.

Notification of Grades

Grade reports for the fall term are sent out by the Registrar at the end of February. Spring grade reports are mailed to permanent addresses at the end of June. No grades are given to students either by telephone or in

person until all grade reports are prepared. Students who wish to know their grades immediately after a course ends may leave a stamped, self-addressed postcard with their instructor or hand it in with the bluebook in courses giving final examinations.

Transcripts

Official transcripts may be ordered by filling out a form in the Registrar's Office. The first copy is free, subsequent copies are \$1.00 each. Students should allow three working days for processing transcript orders. Transcripts given directly to students are stamped "Issued to Student," and anyone requesting records should check to be sure other institutions accept transcripts sent by someone other than the Registrar.

If a student leaves the School with outstanding financial obligations to the University, transcripts are sent directly to the student and not to third parties. Such transcripts carry notations "Issued to Student" and "Student's Financial Obligations to the University Have Not Been Met."

Student Addresses

All students must give their local address at registration and should keep the Registrar's Office informed of any changes in their local address.

ID Cards

Students are issued official Harvard University identification cards for use throughout the Cambridge community to gain access to libraries and classroom buildings. Since these cards are often used as general identification for cashing checks, it is essential to take precautions against loss. Replacements may be ordered through application at the Registrar's Office, where temporary IDs are issued. A replacement fee of \$10 is charged to a student's term bill.

Summer Study

HSPH has no regular summer course program, but some students elect to do tutorial or research work during the summer recess. A maximum of five credits will be given for degree credit in summer study. Students must file summer registration forms with the Registrar's Office before the end of May in order to receive degree credit for summer work. Tuition for summer courses may not be applied toward tuition requirements for the degree.

Harvard and MIT Summer Schools

Students should consult departmental advisors before enrolling. Departmental approval is required for degree credit and the Committee on Admissions and Degrees considers petitions for degree credit only after final grades are received in the Registrar's Office. Students must request transcripts and file petitions by published deadlines.

All other summer work must have prior approval of both department and the CAD for consideration for degree credit. The deadline for such petitions is May 25. Degree credit is not ordinarily granted for work done at universities other than Harvard and MIT.

The Grading System

The grading system is as follows: Courses on the 100 and 200 level may be taken with ordinal or pass/fail grades. The ordinal system used for 100 and 200 level courses will be A,B,C, and F. The grades will have the following numerical values: A=4.0 (Excellent), A-=3.7, B+=3.3 (Good), B=3.0, B-=2.7 (Satisfactory), C+=2.3, C=2.0 (Poor), C-=1.7, F=0 (Failing). Courses at the 300 level may only be taken pass/fail.

Minimal grade point average requirements and distributional requirements have been instituted for all students entering degree programs in the fall semester of 1979 and thereafter. Semester and cumulative grade point averages will be computed on courses taken on an A,B,C,F basis anywhere at Harvard and M.I.T. Courses taken pass/fail or on grading systems other than A,B,C,F will not be calculated in the grade point average. The minimal standard for satisfactory work will be 2.7; students must have that average or above to qualify for a degree. Individual departments and programs may set more restrictive standards.

Students taking a one-year degree program are required to take a minimum of 30 credits on the A,B,C,F basis and the remainder as the student elects. Students taking degree programs lasting two or more years are required to take a minimum of 60 credits on the A,B,C,F basis and the remainder as the student elects. This requirement will be assessed by the Registrar prior to the awarding of any degree. Doctoral students must receive grades of either A or B in courses counted for their major or minor fields.

Exceptions to this policy can be sought by students or faculty by petition to the Committee on Admissions and Degrees. Cross-registered courses taken elsewhere at Harvard can be included in the minimums if they are at the 100 level or above and if taken with an A,B,C,F grading system.

Faculty are encouraged to offer both grading options in all 100 and 200 level courses. However, faculty who wish to offer only the A,B,C,F option may do so but must publish this information in advance of the beginning of the course. Students have the right to receive grades on the A,B,C,F system, if designated on the study card at the beginning of the period.

When courses are taken on a pass/fail basis, grades A through C- are equated with a Pass. A grade of F has the same value in either the ordinal or the pass/fail system.

Students may normally repeat failed courses for both grade and credit. The grade received when the course was taken the first time remains a permanent part of the record, but only the repeated grade will be used in computing the cumulative grade point average.

A grade of incomplete (INC) may be awarded at the discretion of the instructor. An INC will be recorded as a failure on a student's permanent record unless the deficiency has been corrected by the end of the next term, on the deadline noted in the academic calendar. An instructor may require that the student correct the deficiency earlier, in which case the student and the Registrar should be informed in writing of the deadline. Students

receiving an incomplete for a course required for graduation will not be awarded a degree until the course work is satisfactorily completed and a passing grade submitted to the Registrar's Office in writing.

Final Examinations

Final examinations are ordinarily scheduled during the last week of each period. Final examinations must be taken and may not be repeated, except that, with the concurrence of the Assistant Dean for Student Affairs and the Chairman of the Department concerned, a faculty member responsible for a first-quarter fall course will have the option of offering a re-examination to students who have failed the regular final examination. A student who does not attend a final examination in a course will be given a grade of ABS. At the discretion of the Assistant Dean, makeup examinations may be given to students who were absent from the regularly scheduled final exam because of significant medical or personal reasons. In such cases the Assistant Dean should, if possible, be given notice in advance of the beginning of the examination. Unexcused absences remain ungraded, and no credit is given for the course. Incompletes may not be given for unexcused absences from final examinations.

Grade Points

Grade points for a course will be determined by multiplying the number of credit units times the value associated with the grade assigned. The grade point average is defined as the sum of grade points earned divided by the total credit units for which grade points were calculated.

Grade Point Averages

The minimum standard for satisfactory work at the School is a B- average or a grade point average of at least 2.7. In some departments and programs, however, students will be expected to maintain an average above this minimum. Such requirements will be stated in advance. A student whose record is below the standards of the department, may, at the end of a given term, be informed by the Committee on Admissions and Degrees, upon recommendation of the department, that he or she may re-register subject to specific academic conditions which if not fulfilled by the date specified may result in the termination of candidacy.

Alternatives

During registration, each student should mark the box on each course card indicating which grading system — ordinal or pass/fail — is desired. Note that 300-level courses are graded only P/F. In the event of cross-registration, the grading system of the host school must be used for that particular course. Students planning future application to doctoral programs are advised to elect the ordinal system. Doctoral students must elect the ordinal system in all courses offered for their major or minor fields. Students should discuss the advantages and disadvantages of both the ordinal and P/F grading systems with their advisors before selecting an option.

Ordinal grades provide a more definitive record of student performance and are therefore useful in future job and academic applications. An advan-

tage of the P/F system is that students will not be inhibited from taking courses of interest outside their areas of concentration for fear of obtaining poor grades. Also, some students already have advanced professional degrees or job experience which make the ordinal system unnecessary for their future plans.

In selecting grading options, students should consider both minimum school distribution requirements and any additional requirements set by their department or program.

Calculation of Credit Units

Credit units are assigned on the basis of the total amount of time required by a course, both in class and outside of class. Twenty credit units constitute a full program for one term. Ordinarily a full-time student may register for no more than 25 credit units per semester unless permission is granted by the Committee on Admissions and Degrees before the drop/pass deadline. Part-time students may register for no more than 12.5 credits per semester.

Changes in Grades

Final authority for the designation of grades rests with the principal instructor in each course. Once a grade has been reported in writing to the Registrar's Office, it can only be changed upon written request of the instructor to the Dean for Academic Affairs. This does not apply to changes from INC to appropriate grades for credit. Such letters must contain an explanation as to why the grade is being changed. If the grade is based on clerical error, the Dean for Academic Affairs may authorize the Registrar to change the grade. If it is an error of judgment or because of new information regarding the student's performance, the change will be approved only if also approved by the Committee on Admissions and Degrees. The instructor is ordinarily expected to indicate that he or she has reviewed the work of other students in the course in order to determine that no similar errors have been made and gone uncorrected.

Financial Information

Tuition and Fee Schedule

The tuition fees for the academic year 1981-82 are listed below:

\$6,450*	Full-time resident tuition
3,325*	Half-time resident tuition
3,375*	Doctoral reduced tuition
1,795*	Doctoral half-time reduced tuition
740*	Doctoral facilities fee (resident)
290	Nonresident doctoral guidance fee
30	Active file fee for degree candidates on leave of absence

	Part-time special students enrolled for 6 to 9 credit units per term:
270*	First credit unit of work per term
155	Each additional credit unit
	Part-time special students enrolled for 5 or fewer credit units per term:
155	Charge per credit unit per term
	Degree candidates who register and receive credit for research or supervised study during the 1982 summer session:
755	Five-credit program
10	Late Registration Fee
10	Late Study Card Fee
10	Drop-Add Petition Fee (for each petition filed)

Final Doctoral Tuition Fee

For the registration period in which a dissertation is formally approved and accepted by the department and the Committee on Admissions and Degrees, a Doctor of Science or Doctor of Public Health candidate must have paid at least half of the then current facilities fee. The fee for 1981-82 is \$175. Students graduating in November or March who wish to maintain health insurance during the final term are required to pay one half the University Health Services fee (\$117.50) and one half the Blue Cross/Blue Shield fee (\$102.50).

The starred amounts include the University Health Service fee for medical care for all resident students enrolled for 6 or more credit units. This fee may not be waived. University Health Service coverage extends from September 1 through August 31.

Hospital insurance is billed separately. A Blue Cross/Blue Shield student insurance plan provides coverage for many costs of medical care not offered at the University Health Services. Coverage under this plan extends from September 1 through August 31. The tentative premium for 1981-82 is \$205. The Blue Cross/Blue Shield student insurance plan is compulsory for all nonimmigrant foreign students; all other students are also enrolled in the plan unless they have other adequate medical insurance and submit a waiver within two weeks following registration. Students who fail to file waivers will be responsible for any fees billed for that term. Waivers are approved by the Director of the University Health Services.

It should be noted that nonresident doctoral students are not eligible to participate in any Harvard health plan. For continued Blue Cross/Blue Shield coverage, nonresident doctoral students must file special forms with the student insurance office in Holyoke Center by the deadlines published for each semester. This insurance is compulsory for all nonimmigrant foreign students in nonresident status within the United States.

Payment of Fees

No student will be permitted to register in any term until all money due from prior term bills and at least one quarter of the commencing term's tuition and fees have been paid in full. Students not enrolled in the extended payment plan must pay the full amount by the dates indicated in order to register.

Special students enrolled for less than 10 credits are required to pay all tuition and fees for the term in full when they file study cards. In event of withdrawal, tuition will be prorated according to the schedule below. All other bills for tuition and fees will be issued and payable as follows:

Student term bills for the fall term will be issued on July 25, and will be payable *in full* by August 25.

Bills for the spring term will be issued in early January, and will be payable *in full* by January 22.

Payments may be scheduled over monthly installments (four each term) through an optional payment plan that is available at a service charge of \$15 per term.

Students who are candidates for degrees must have paid all bills to the University at least three days before the day upon which the degrees are to be voted.

A student who leaves the University for any reason whatever must pay all charges against him or her immediately upon receipt of a bill from the Office of Fiscal Services. Every student is held responsible for the payment of fees until he or she has notified the Registrar *in writing* of his or her intention to withdraw from the School. A student who fails to submit written notification of withdrawal will be liable for tuition and fees for the term.

A student who leaves the School during the academic year is responsible for tuition charges in accordance with the following:

Leaves by		Percent of Total
<i>First Term</i>	<i>Second Term</i>	Semester Charges
October 25	February 25	25%
November 25	March 25	50%
December 24	April 25	75%

Students leaving after December 24 and April 25 of the first and second terms, respectively, are responsible for full tuition charges.

If a student who is receiving any form of financial aid withdraws and is entitled to a refund, a portion of that refund may be returned to the financial aid fund. A special refund rule applies to these funds: National Direct Student Loans, Guaranteed Insured Student Loans, Federally Insured Student Loans. These funds must receive the same proportion of the refund as the proportion which each constituted of the original aid package.

All term bills are sent to the student at his or her local address unless the Office of Fiscal Services is requested in writing to send them elsewhere.

Any student whose indebtedness to the University remains unpaid on the date fixed for payment is deprived of the privileges of the University. Reinstatement is obtained only by consent of the Dean of the School in which the student is enrolled after payment of all indebtedness and a reinstatement fee of \$10. As a further condition of reinstatement, the student is required to file with the Office of Fiscal Services a bond in the amount of \$1,000 as security for the payment of future term bills.

Registration and Tuition Guidelines

The following guidelines for payment of tuition apply as stated to all students who enrolled at the School of Public Health for the first time on or after September 1, 1979. The guidelines also apply to students enrolled at the School before that date, with the exception of certain aspects of the policy concerning payment of tuition by doctoral candidates. Information concerning the applicability of the guidelines to doctoral students enrolled in a degree program at the School during the academic year 1977-78 can be obtained from the Registrar's Office.

Degree Candidates

After admission to the School of Public Health and until fulfillment of requirements for the degree, all degree candidates must be registered continuously in one of the following registration categories:

1. Resident students
2. Nonresident doctoral students
3. Students on leave of absence

All degree candidates must pay the appropriate tuition rate for each registration period as described below; they may not pay tuition on a "per credit" basis. It should be noted that, in order to qualify for deferment of an educational loan, a student must be registered for no less than a half-time study program.

Tuition for summer school courses may not be credited toward any tuition requirements for the degree.

1. Resident Students

All degree candidates who are enrolled in courses or who intend to use any Harvard academic facilities for an extended period of time must register as resident students.

Students who are registered in a master's degree program in the School will be charged full tuition.

Students who are registered in a doctoral degree program in the School will be charged full tuition for two years (with up to one year of credit for full tuition paid as a currently enrolled master's degree candidate at the School), followed by one year of reduced tuition. For subsequent terms of enrollment the facilities fee will be charged, which provides for full access to Harvard academic facilities and the University Health Services, and for the issuance of a Harvard resident identification card.

Part-Time Resident Students

Any degree candidate who registers for less than full-time must in any event fulfill the full-time full tuition requirements for the degree. A master's degree student completing a two-year program in three years must plan to pay at the full-time full tuition rate during the first year and half-time tuition each subsequent year at the rate for that year.

2. Nonresident Doctoral Students

Doctoral students who no longer reside in the Greater Boston area* and who are engaged in less than half-time work on the degree and who have received permission from their department and the Committee on Admissions and Degrees to pursue a portion of their programs as nonresidents will be charged the nonresident doctoral fee. Students in this category normally will have completed payment of at least the required two years of doctoral full tuition and one year of reduced tuition before applying for nonresident status; they must in any case complete this payment prior to their graduation and will be billed accordingly while in nonresident status.

Nonresident doctoral students are charged the nonresident doctoral guidance fee, which covers periodic consultation with the student's doctoral adviser but does not provide for the use of Harvard facilities or for the issuance of a Harvard identification card. Also, as noted above, a student registered for less than a half-time study program may not qualify for deferment of an educational loan. Upon expiration (or earlier termination) of CAD permission for nonresident status, or for a term in which use of Harvard facilities is required, the appropriate resident rate will be charged.

3. Students on Leave of Absence

Degree candidates who will not, during a given registration period, be engaged in study or research for a degree from the School, and who will be making no use of Harvard facilities, must apply to the Registrar for a leave of absence. Leaves of absence are ordinarily granted for a maximum of two registration periods and require approval of the student's department and of the CAD.

Students on leave of absence are required to pay the active file fee to maintain their degree candidacy. Upon expiration (or earlier termination) of CAD permission for leave of absence, students will be charged the appropriate tuition rate.

Termination of Degree Candidacy

Students who do not intend to register in any one of the categories noted above must terminate their candidacy for the degree. Such students are required: (1) to file in the Registrar's Office a written notice of intent to

*Students residing within a 50-mile radius of downtown Boston will normally be considered resident for tuition purposes.

withdraw; (2) to inform their department; and (3) to arrange an exit interview with the Financial Aid Office, when appropriate. If students do not terminate their degree candidacy formally but fail to register for a full term or longer, degree candidacy will be terminated automatically. Students who are withdrawn must apply for readmission.

The CAD, with departmental recommendation, may terminate a student's degree candidacy on the basis of unsatisfactory performance in coursework. Candidacy also will ordinarily be terminated in the case of a student who has exceeded the five-year limit for completion of degree requirements following registration as a doctoral candidate. Doctoral candidacy may be terminated as a result of failure to submit an acceptable proposal for the thesis. Also, the Administrative Board may recommend termination of candidacy in matters involving academic discipline.

A student who wishes to reactivate degree candidacy should file an application for readmission, which must be approved by the department and by the CAD. Prior to readmission, the student must pay any outstanding bills to the University, as well as the then-current active file fee for each registration period that has elapsed since the termination of candidacy.

Nondegree Candidates

Requirements for admission to nondegree programs are described on p. 73.

Special students registered for full-time or for half-time study programs will pay the corresponding full tuition rate; those registered for less than half time will pay tuition on a "per credit" basis as outlined in the tuition and fee schedule.

Field Studies

Field opportunities, listed under each department's course offerings and bearing the course number 330, often entail travel expenses that must be met by the student. Information about estimated expenses should be obtained from the appropriate department.

Living Expenses

Living costs in the Boston area are higher than in most areas from which students come. The following are minimum amounts estimated that students will need in the academic year 1981-1982 to cover expenses for approximately nine months.

A single person will need at least \$13,975, in addition to travel expenses, to cover the cost of tuition (\$6,450), health fees (\$205), books (\$500), rent (\$3,000), and other living expenses (\$3,820) for approximately nine months. A family of four will need at least \$19,880, in addition to travel expenses, to cover tuition (\$6,450), health fees (\$205), books (\$500), rent (\$4,725), and other living expenses (\$8,000), including medical care for spouse and children.

Applicants who plan to enroll in a two-year program should allow for proportionate additional expenses for the summer months and allow for a twelve to fifteen percent increase for the academic year 1982-1983.

Housing

The Henry Lee Shattuck International House is an apartment residence operated on a nonprofit basis by the School for its full-time students and their families from the United States and abroad. Located at 199, 203, and 207 Park Drive, within walking distance of the School, the House consists of sixty-nine individual apartments, each with its own kitchenette and bath.

All apartments are rented furnished with basic items except for linens, blankets, and kitchen utensils. No unfurnished units are provided. The monthly rent charge includes all utilities — hot water, heat, gas, and electricity — but not telephone service.

Applications should be submitted by May 15, although late applications will be considered as long as space is available. For application forms and more detailed information, write to Carol O'Connell, Office of Student Affairs, Room G-4, Harvard School of Public Health, 677 Huntington Avenue, Boston, Massachusetts 02115.

The Office of Student Affairs maintains an up-to-date list of private housing and local real estate agencies.

The Harvard University Housing Office in Cambridge arranges for housing in University-owned complexes. Information and application forms may be obtained by writing to the Harvard University Housing Office, 7 Holyoke Street, Cambridge, Massachusetts 02138. A copy of the student's letter of acceptance from the School must be enclosed to prove affiliation. This Office also maintains listings of apartments and houses not owned by the University. These listings must be viewed in person; information is not given out by mail or telephone.

Student Health Service

Under the University Health and Insurance Plan, students at the School of Public Health receive medical care and insurance toward hospital expenses. Medical care is provided through the facilities of the Medical Area Health Service, located in Vanderbilt Hall. The hospitalization insurance extends for a period of 12 months from September 1, and covers hospitalization in Boston and elsewhere. Nondegree, post-doctoral research and teaching fellows who are in a training status are required to enroll in the Student Health Plan unless they can show that they have comparable coverage.

In addition, a prepaid program for spouses (including maternity benefits) and children of full-time students is available. As the plan provides extensive benefits for ambulatory and inpatient care, all who are eligible are strongly advised to enroll. Its coverage, like that of the Student Plan, extends for a period of 12 months from September 1, and provides full semiprivate hospitalization benefits. A descriptive brochure about the plan for dependents is sent to students before registration or may be obtained from the Registrar.

Any illness necessitating absence from classes should be reported to the Medical Area Health Service Office by the student or an attending physician, and to the Registrar's Office at the School. A physician from the Medical Area Health Service, on call twenty-four hours a day, can be reached through the switchboard of Harvard University.

For further information, contact the Director, Medical Area Health Service, 275 Longwood Avenue, Boston, Massachusetts 02115. Telephone: (617) 732-1370.

Fellowships and Loans

The Harvard School of Public Health is a participant in the Harvard University Guaranteed Insured Student Loan Programs (GISL/FISL). This program permits a student who either is a U.S. citizen or has immigrant status to borrow up to \$5,000 a year, providing the student has less than \$20,000 in outstanding loans.

Some fellowship support is available through departments and special programs from federal and nonfederal sources for qualified students in a variety of fields. In addition, there are limited amounts of funds available under the National Direct Student Loan and College Work Study programs.

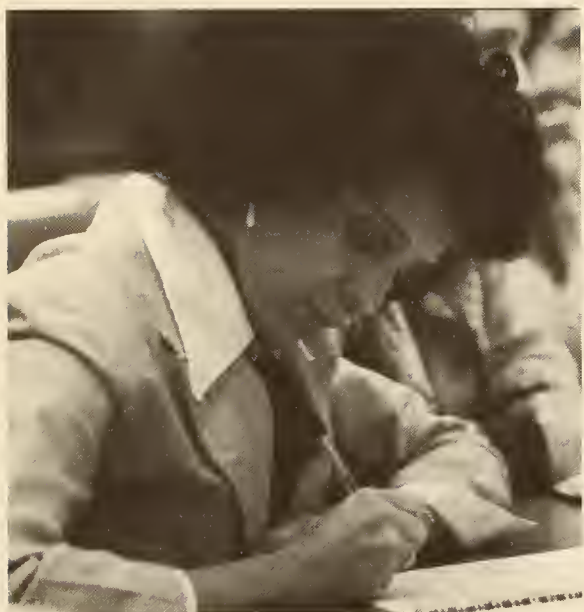
If a student who is receiving any form of financial aid withdraws and is entitled to a refund, a portion of that refund may be returned to the financial aid fund. A special refund rule applies to these funds: National Direct Student Loans, Guaranteed Insured Student Loans, Federally Insured Student Loans. These funds must receive the same proportion of the refund as the proportion which each constituted of the original aid package.

As a matter of policy, the Harvard School of Public Health does not discriminate among applicants and students in fellowship and loan programs on the basis of race, religion, sex, national origin, color, creed, handicap, sexual orientation, Vietnam era or veteran status, marital or parental status, or age.

Detailed information about fellowships and loans can be obtained by writing to Ms. Margaret C. Salmon, Director of Financial Aid, Harvard School of Public Health, 677 Huntington Avenue, Boston, Massachusetts 02115.

Scholarships

The Committee on General Scholarships and the Sheldon Fund administers a number of scholarships which are open to applicants from all Schools of the University. These include Travelling Fellowships, Restricted and Unrestricted Scholarships. Eligibility for many of these funds is very specific and varies according to terms of donors. Nomination for these scholarships must be made by the Director of Financial Aid. For a complete list of University Scholarships, applicants should consult the General Catalogue Issue of Harvard University.



Some awards are made available through departments or the Financial Aid Office and are based on scholastic achievement. One example is the John E. Thayer Scholarship which is the Bequest of John E. Thayer, the income to be paid "to the ten most meritorius scholars in Harvard University every year — the income shall only be paid to such meritorious scholars as who actually need the same." This award is determined by the Committee on Financial Aid following the first semester of each academic year. The award is based on a review of the grade cards of students who have elected the ordinal grading system and a needs analysis based on financial records on file in the Office of Financial Aid.

Office of Student Affairs

The Office of Student Affairs is concerned with many aspects of student life. The staff works with other groups and individuals to identify the special needs of students, plan and direct orientation, publish a weekly newsletter, and coordinate social events. Student recruitment activities are coordinated by staff in this Office. Up-to-date information is maintained on housing, child-care facilities, transportation, and athletic outlets in the Medical Area, Boston, and Cambridge.

The Office provides career counseling and maintains a resource center containing job listings. The Office contacts potential employers to acquaint them with programs at the School and to request information about job openings. Current positions (permanent, summer, and part-time) are posted. Students are assisted in writing resumes, arranging for interviews, and exploring career opportunities. The Office's activities complement the efforts of departments, programs, and faculty advisers. Data collected about positions and salaries of graduates are available to prospective students.

Further information can be obtained from the Assistant Dean of Student Affairs, Harvard School of Public Health, Room G-4, 677 Huntington Avenue, Boston, Massachusetts 02115.

Alumni Association

The School's Alumni Association has a membership of approximately 3,200 graduates located throughout the world. The Association is governed by an elected Council which meets twice a year, once in the fall at the APHA annual meeting, and once in the spring at the School. In 1977 the Association began fund raising for the Margaret Dale Penrose Scholarship Fund to provide financial assistance to needy students. For information about alumni activities, contact the Assistant Dean for Student and Alumni Affairs.

Courses of Instruction

In the course listings, course numbers from 100 to 199 indicate undergraduate and graduate courses; numbers from 200 to 299 indicate primarily graduate courses; and numbers from 300 to 399 indicate graduate courses of reading and research.

The letters "a," "b," "c," "d," and "e" following the course number indicate the period(s) in which a course is given, with "a" denoting first period and "b", second period (fall); "c", third period and "d", fourth period (spring). The letter "e" indicates supervised special studies or field observations, usually during the one-week period between fall and spring terms or during the post-class period following the spring term.

The credit assignment is given in units following the statement of number and length of sessions per week. Course titles in bold type are often followed by titles and numbers in roman face (enclosed in parentheses). This indicates that the course is also listed in other Harvard catalogs, namely, Arts and Sciences, and that the course credit is provided through that faculty as well as through the School of Public Health, e.g., **MCHA-BEH 237c,d** (Education, P-220), **POP 185a,b** (Sociology 185), **EHS 264c,d** (Engineering 283).

The School reserves the right to make changes in the regulations and courses announced in this *Register*.

Interdepartmental Courses

ID 201a,b. Historical Analysis of Public Health Policy and Practice: United States, 1900-1975

Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Rosenkrantz, Dr. Kingsdale.

Identifies six issues to illustrate the relationship between social experience and professional responsibility for prevention of disease. Topics selected for analysis based on historical example illustrate policy-related issues: how health hazards are identified; determinants of resources; criteria of efficacy and equity in policy and services. Recommended for students who wish to relate their special competence to the network of objectives in public health.

ID 201 c,d. Historical Analysis of Contemporary Health Policy and Management

Seminar. *One 2-hour session each week. 2-5 units.* Dr. Rosenkrantz, Dr. Kingsdale.

Explores historical methods of analyzing contemporary health systems problems and informs students of the evolution of important issues in health policy and management. Four sets of issues will be analyzed: manpower policy, hospital organization and incentives, the social control aspects of medicine, and health insurance. Beyond consideration of the uses and misuses of history in policy analysis, the course will examine contemporary problems in these four issue areas in light of their historical development.

ID 209a,b. Health Services in Developing Countries

Seminars. *One 2-hour session each week. 2.5 units.* Dr. Cash, Dr. Koch-Weser.

Provides a broad overview of health and health care problems in developing countries. Central issues include: ecologic, environmental, and other characteristics of developing countries affecting health; analysis of their health problems, the alternative approaches to solving them, the policy and planning issues in applying solutions, and the organizational alternatives for utilizing health resources; the nature, composition, and training of the health team for use at the local and district levels; and the relation of health to development and the position of health in national planning priorities. Preference given to students who have previously been involved in international health activities.

ID 212c. Biomedical Writing

Seminars. *One 2-hour session each week. 2 units.* Dr. Chernin.

Writing scientific papers is an integral part of the research process. This course develops practical skills and experience in planning and writing articles that meet the editorial demands of biomedical journals. The salient elements of a well-prepared article — logical organization, clear and concise scientific prose, and understandable tables and figures — are emphasized by criticizing short papers written by the participants on biomedical subjects of their own choice.

Enrollment limited to 10 students and requires approval of the instructor at least two weeks before the quarter begins. This course will be given pass/fail.

ID 215c,d. Environmental Health Evaluation and Management

Seminars, lectures. *Two 1½-hour sessions each week; additional computational sessions to be arranged. 5 units.* Dr. Harrington.

Introduces concepts and analytical methods for the quantitative evaluation and management of man's environment. Topics include: the development of natural resources, resulting environmental conditions, and effects on human health. Where appropriate, mathematical models are developed and critiqued in a systems analysis framework. Students are required to submit a term project.

A strong background in college-level mathematics is assumed.

ID 217c,d. Capitalism, Socialism, and Public Health

Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Lewontin, Dr. Levins, Visiting Lecturers.

General course contrasting the analysis of problems in public health, nutrition, and population by Marxist and capitalistic social and economic theories. Topics include: Marxist economics and social theory, population control, "green revolution," nutrition planning, maternal and child health, and occupational health.

ID 220c,d. A Case Study in Integrated Planning

(Economics 2730, Education A-885, Planning 281)

Lectures, seminars. *Two 2-hour sessions each week. 5 units.* Dr. Cash, Dr. David Cole, Lecturer on Economics, Harvard Institute for International Development, Dr. John Thomas, Institute Fellow, Harvard Institute for International Development.

This seminar brings together students and faculty from the Graduate Schools of Public Health, Design, Education, Arts and Sciences (Economics), and from the Harvard Institute for International Development, to write a development plan for a specific geopolitical area of a developing country. This development planning problem is derived from an ongoing HIID project and emphasizes an inter-disciplinary team approach to problem solving and planning.

Enrollment subject to approval of the instructor.

ID 221b. Case Studies in Decision Making in the Control of Infectious Diseases of Public Health Importance

Lectures, team meetings. *Two 2-hour sessions each week. 2.5 units.* Dr. Nichols, Guest Lecturers.

Cases drawn from domestic and Third World sources are studied from the standpoint of decision makers in the control of infectious diseases of public health importance. Students in teams will propose solutions to problems after utilizing information drawn from a spectrum of sources including: molecular biology, host-parasite interactions, epidemiology, management of resource allocations, cultural and socioeconomic constraints.

Enrollment limited to 60 and subject to approval of the instructor. No auditors. Ordinal grading.

ID 222d. Case Studies in Health Organization in Developing Countries

Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Nichols, Guest Lecturers.

Using a fictitious country as a case study, students are taught practical skills relevant to LDC's. These include: building a data base; conduct of field studies and pilot projects; personnel and laboratory requirements for building an epidemiological organization; estimation of health manpower requirements; decentralization of authority; supply requirements; drug production or purchase; top to bottom integration of services; attracting funds from internal and external sources.

Enrollment limited to 60 students and subject to advance approval of the instructor. No auditors. Ordinal grading.

ID 223c. Case Studies in Public Health Decision Making

Lectures, discussions. *Two 2-hour sessions each week and small group discussions to be arranged. 2.5 units.* Dr. Stason.

Selected important health policy/public health problems are examined in the case format from a multidisciplinary point of view. The course will stress the contributions and the interdependence of the basic and clinical sciences, the quantitative sciences — epidemiology, biostatistics, economics, and decision analysis — and the social sciences in the analysis of such problems.

Background in biostatistics, economics, epidemiology, and decision analysis recommended. No auditors.

ID 225c. A Case Study in Urban and Industrial Health Planning in a Developing Country

Lectures, small seminars, workshops. *Two 2-hour sessions each week. 2.5 units.* Dr. Nichols. Curative and preventive medicine requirements for a large industrial project and surrounding city are studied together with essential public health support services. Planning includes: definition of the problem; description of health hazards and load on the health services; alternate solutions; enabling and functional linkages required; functional programming including proximity matrices, facilities, staffing, operational support, management and administration requirements, costing and implementation.

Enrollment limited to 60 and subject to approval of the instructor. No auditors. Ordinal grading.

Behavioral Sciences**BEH 132a,b. The American Household in Demographic Perspective**

Not given 1981-82.

Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Masnick.

Examines in the context of longer historical trends the recent dramatic changes in family structure brought about by changes in patterns of household formation, marriage, separation, divorce, remarriage, childbearing, female labor force participation, and mortality. Implications for elements of the social order receive emphasis, including general integration of age structure, characteristics of the labor force, familial support in health care, and the housing market.

BEH 201d. Health and Behavior

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. McAuliffe, Dr. Eckenrode. Considers the reciprocal relationship between health and behavior. Reviews attitudinal and sociodemographic factors in preventive health activities and disease.

BEH 202b. Sociological Perspectives in the Study of Health Attitudes and Behaviors

Not given 1981-82.

Lectures, seminars. *Two 1½-hour sessions each week. 2.5 units.* Members of the Department. Examines the sociological literature on consumer attitudes, sick-role behavior, prevention, and illness. Also considers methodological issues specific to this substantive area. Prereq. Introductory sociology or equivalent, or permission of the instructor.

Students interested in *health promotion* and *health education* are recommended to take the following sequence.

BEH 211a. Provides introduction and framework.

BEH 212b. Facilitates development of specific interests.

BEH 213c. Performs analysis of determinants of behavior.

BEH 214d. Guides program planning and implementation.

BEH 215d. Discusses theories of individual and social change.

BEH 216c,d. Presents case studies in a broad range of problem areas.

BEH 211a. Health Promotion

Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. McAlister.

Discusses the way behavioral and environmental phenomena influence one another and interact to threaten health. Introduces relevant theories on the development and change of individual and group behavior. Outlines educational and organizational strategies for influencing social and environmental change. Illustrations of health promotion in a variety of public health problem areas are presented.

BEH 212b. Change of Health Behaviors

Lectures, discussions. *One 3-hour session each week. 2.5 units.* Dr. McAlister.

Designed to provide students with an opportunity to develop specific interests in health promotion. Content includes theories of behavior change, community organization and communication, as well as analysis of specific programs. Each student selects a specific problem area for discussion and field work.

Prereq. Previous course work in social/behavioral sciences or relevant experience, and permission of the instructor.

BEH 213c. Behavioral Analysis

Lectures, discussions. *One 3-hour session each week. 2.5 units.* Dr. Benfari.

Focuses on the psychological processes affecting performance and change in individual behavior, such as roles and expectations, perception, motivation, communications, stress, and life cycle changes. The learning model is based upon an experimental approach using cases, simulations, and personal involvement.

BEH 214d. Implementation of Intervention Programs

Lectures, discussions. *One 3-hour session each week. 2.5 units.* Dr. Benfari.

Focuses on the planning, implementation, and evaluation of intervention programs addressing the primary prevention of disease. Examines risk factor reduction and life style changes in promoting health.

BEH 215d. Inducing Social Change

Seminars. *Two 1½-hour sessions each week. 2.5 units.* Dr. Mertens.

Designed for various specialists in public health who are charged with responsibility for introducing changes in organizations and communities. The subject matter includes methods and theories of teaching, principles of individual and group psychotherapy, approaches to sensitivity training and group dynamics, and organizational theory. Techniques and procedures illustrating these theories are presented through readings, discussions, and case illustrations.

BEH 216c,d. Case Studies in Health Promotion

Case Studies. *One 2-hour session each week. 2.5 units.* Dr. McAuliffe, Dr. Manning, Guest Speakers.

Examines health promotion/education interventions in the U.S. and developing nations. Teaches techniques of intervention design using print and non-print media. Applies basic principles of education and social psychology.

BEH 220a,b. Psychiatric Epidemiology: Problems, Concepts, and Methods

Seminars. *One 3-hour session each week. 5 units.* Dr. Wechsler.

Surveys the field of psychiatric epidemiology covering studies using data from psychiatric treatment services and institutions as well as field surveys of mental health in general populations. Topics include alcoholism and drug addiction, behavioral disorders, as well as major psychoses.

BEH 222c,d. Substance Abuse

Seminars, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. McAuliffe, Dr. Wechsler. Covers drug abuse and addiction in the "c" period; alcohol abuse and alcoholism in the "d" period. Topics in each period include epidemiology, effects on health, etiology, prevention and treatment, and public policy.

BEH 230a,b. Methods of Social Research: Design and Measurement

Seminars. *Two 1½-hour sessions each week. 5 units.* Members of the Department.

Social research methods, including participant observation, social experiments, and surveys, are examined with respect to design and measurement. Topics discussed at an advanced level appropriate for doctoral students.

Prereq. BIO 202c,d.

BEH 231c,d. Methods of Social Research: Data Collection and Analysis

Seminars. *Two 1½-hour sessions each week. 5 units.* Dr. Gortmaker, Dr. Walker.

Topics include: sampling, data collection techniques, construction of questionnaires, interviewing, costs of data collection, computer processing of large data files, and selected topics in the analysis of behavioral science data. Prereq. BEH 230a,b, or permission of the instructors.

MCHA-BEH 237c,d. Child Development and Social Policy (Education P-220)

Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Walker.

(Course described under Maternal and Child Health and Aging.)

BEH 300a,b,c,d,e. Tutorial Programs

Time and credit to be arranged. Members of the Department.

Arrangements may be made with individual instructors to give a reading course on topics not covered in the Department's course offerings.

BEH 350. Research Training

Training in research is available through individual arrangements with the members of the Department.

Biostatistics

BIO 101a,b. Principles of Biostatistics

Lectures. *Two 1-hour sessions each week.*

Laboratory. *One 2-hour session each week. 5 units.* Dr. Drolette.

Lectures and laboratory exercises acquaint the student with the basic concepts of biostatistics, their application and interpretation. Topics include: descriptive statistics, probability distributions, inference, tests of significance, association, and regression. Laboratory groups will be organized by areas of academic interest or specialization.

BIO 111c,d. Biostatistics for Medical Investigators

Lectures. *One 1-hour session each week. 1 unit.* Dr. Zelen.

Topics include: role of randomization, replication, and local control; planning of scientific experiments, therapeutic investigations and prognostic factors; concept of a population, mean, and variance; confidence procedures for one and two population problems; analysis of proportions; survival data, life tables, and maximum likelihood estimates.

BIO 202c,d. Statistical Methods in Research

Lectures, discussions. *5 units.*

A second course in statistics emphasizing the study of relationships between variables. Topics include multiple regression, analysis of variance, and analysis of categorical data. Sections (listed below) are directed to problems in laboratory, epidemiologic, or clinical settings. Students should register for one of the three sections.

SECTION 1. *Statistical Methods in Experimental Research.* Dr. Feldman.

SECTION 2. *Statistical Methods in Epidemiologic Research.* Dr. Ware.

SECTION 3. *Statistical Methods in Observational Research.* Dr. Reed.

Prereq. Bio. 101 or equivalent.

BIO 205c,d. Mathematical Foundations of Biostatistics

Lectures. *One 2-hour session each week. 2.5 units.* Dr. Drolette.

Material includes: mathematical descriptions of commonly used distributions; standard procedures for estimating the moments of a distribution; and mathematical foundations of statistical inference, including the Neyman-Pearson lemma, the likelihood ratio, the central limit theorem, power and Bayesian inference. Prereq. A course in elementary calculus.

BIO 207c,d. Survey Research Methods in Community Health

Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Bailar.

Research design, sample selection, questionnaire construction, interviewing techniques, the reduction and interpretation of data, and related facets of population survey investigations are covered. Focuses primarily on the application of survey methods to problems of health program planning and evaluation. Treatment of methodology is sufficiently broad to be suitable for students who are concerned with epidemiological, nutritional, or other types of survey research.

BIO 210a,b. Topics in Biostatistics

Lectures, discussions. *One 2-hour session each week. 2.5 units.* Members of the Department.

Offered primarily for students majoring in biostatistics or epidemiology, although qualified students from other departments are welcome. The topics to be covered will vary from year to year, based on recent developments in biostatistics and the research interests of the instructor.

BIO 211a,b. Discrete Multivariate Analysis

Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Laird.

Deals with the use of log linear and other models to describe multivariate data with discrete components. Emphasizes practical application rather than mathematical theory. Topics include the analysis of contingency tables, measures of association, standardization of rates, logistic regression, ordinal data, and variance components for discrete data. Methods of estimation, hypothesis testing, and assessment of model adequacy are studied.

Prereq. A statistics course which includes analysis of variance.

BIO-HPM 212a. Forecasting and Its Use in Health Programs and Institutions

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Reed, Members of the Departments of Biostatistics and Health Policy and Management.

A conceptually sophisticated, but mathematically basic, examination of the purposes, methods and data inputs for forecasting in health-related fields. Time series, transfer functions, simulation, and Delphic methods discussed along with their theoretical and empirical forecasting errors. All concepts are grounded in detailed case studies.

Prereq. BIO 101a,b or HPM-BIO 219b,c,d; or those familiar with regression methods may enroll with permission of the instructor.

BIO 213b. Computing Principles and Methods

Lectures, discussions. *Two 1-hour sessions each week.*

Laboratory. *One 1½-hour session each week. 2.5 units.* Dr. Neff, Members of the Health Sciences Computing Facility.

Among the principles and methods of computing and data processing included in the course are: programming, flow-charting, and the use of a statistical program package, a data base management system, and computer program libraries. Criteria for choosing among existing programs are delineated. Case studies used to illustrate methods of data collection, coding, and data reduction.

BIO 214c. Principles of Clinical Trials

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Gelber, Dr. Stanley.

Designed for individuals interested in the scientific, policy and management aspects of clinical trials. Topics include: types of clinical research, study design, treatment allocation, randomization and stratification, data management and quality control, sample size requirements, patient consent and interpretation of results. Students will design a clinical investigation in their own field of interest and will critique recently published investigations.

Prereq. Previous or concurrent enrollment in an introductory statistics course.

BIO-HPM 215b. Health Program Evaluation
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Thompson.

Designed to increase a student's ability to understand the uses and limitations of methods employed to evaluate health programs. Concentrates on a review of various methodologies and focuses on their application.

HPM-BIO 216c. Analysis of Health and Medical Practices (Public Policy S-176m)
Lectures, discussions. *Two 1½-hour sessions each week. 2.5 units.* Dr. Weinstein.
(Course described under Health Policy and Management.)

BIO 217a,b. Probability Theory and Applications
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Louis.

A course in probability theory fundamental to the statistics program. Topics include: algebra of events, axiomatic foundations combinatorial probability, discrete and continuous sample spaces, lebesgue integration, conditional probability and independence, random variables, generating functions and characteristic functions, standard distributions, expectation and variance operators, limit theorems, Poisson processes, and applications in health-related areas.

Prereq. Intermediate calculus (one or two semesters beyond elementary calculus).

BIO 218c,d. Statistical Inference
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Schoenfeld.

A fundamental course in statistical inference. Topics include: methods of estimation, least squares, maximum likelihood, Bayesian methods, properties of estimates, confidence procedures, significance testing, likelihood ratio tests, goodness of fit tests, Neyman-Pearson theory, sufficiency, power and optimality, sequential analysis, non-parametric inference, and decision theory. The theory will be illustrated with examples from health-related research.

Prereq. BIO 217a,b or equivalent.

HPM-BIO 219b,c, 219d. Statistical Methods for Health Policy and Management
Lectures. *Two 2-hour sessions each week. 7.5 units.* Dr. Lavin, Dr. Mehta.
(Course described under Health Policy and Management.)

BIO 220c,d. Multivariate Analysis for Quantitative Data
Lectures, student presentations. *Two 1½-hour sessions each week. 5 units.* Dr. Waternaux.
Topics include: Hotelling's T^2 , principal component and factor analysis, discriminant functions, clustering, and canonical correlation, with some discussion of distribution theory and tests of hypotheses. Students will participate in the analysis of a data set.
Prereq. At least one statistics course beyond the level of BIO 101a,b, knowledge of matrices, and some familiarity with computer packages such as SPSS, BMD, or SAS.

BIO 240c,d. Design of Experiments (Statistics 140)
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Zelen.

To be given 1981-82; offered alternate years. Examines general principles and practical difficulties in controlled experimentation. Topics include: introduction to randomization theory, methods for increasing precision, principal types of designs, mixed and random effects models, and variance component estimation. Intended for students with a primary interest in statistics and biostatistics.
Prereq. One or more courses covering the basic concepts of distributions, expectations, samples, testing, estimation, regression, and analysis of variance.

BIO 251a,b. Data Analysis
Lectures, discussions. *Two 2-hour sessions each week. 5 units.*
Not offered 1981-82.

Teaches the statistical techniques necessary for analyzing data from clinical and biological studies. Major topics include: analysis of normally-distributed data, analysis using distribution-free methods, discrete data analysis, survival analysis, and analysis of data models. Multiple regression and the logistic, loglinear and Cox models are covered in the data models section. The concepts underlying statistical techniques are stressed rather than numerical calculation or mathematical derivation. The course is designed for students in the Health Sciences who will use statistical techniques but do not have the background to take BIO 261.
Prereq. A course in statistics or permission of the instructor.

BIO 261c,d. Theory of Biometry I
Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Feldstein, Dr. Zelen.
Discusses the theoretical basis of concepts and methodologies associated with life tables, the general theory of survival distributions and censoring, competing risk models, and the planning of clinical trials. Material is drawn from recent literature.
Prereq. Statistics 111 or equivalent, or permission of the instructor.

BIO 262a,b. Theory of Biometry II
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Lagakos.
A continuation of BIO 261c,d. Topics include: semi-Markov processes as models for disease processes; models of early disease detection; length-biased sampling; optimization and periodic screening; design and analysis of carcinogenicity experiments; low-dose extrapolation; and methods for combining evidence from different experiments.
Prereq. BIO 261c,d.

BIO 263c,d. Regression and Analysis of Variance
Lectures. *Three 1-hour sessions each week. 5 units.* Dr. Begg.
Examines the methods of least squares and maximum likelihood as applied to linear statistical models: multivariate regression, calibration, analysis of variance, and random effects models. Topics include the development of hypothesis testing, confidence intervals and Bayesian techniques. Exercises and examples emphasize medical applications.
Prereq. A course in statistics at the level of Statistics 110; familiarity with matrix algebra.

BIO 266c,d. Stochastic Processes in Medicine and Biology
Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Lagakos.
To be given 1982-83; offered alternate years. Discusses those areas of modern applied probability useful for model building in the biomedical sciences. Topics include: Poisson processes, birth and death processes, Markov chains and processes, renewal theory, compartment models, random walks and sequential analysis, and the theory of epidemics. Examples are drawn from the biomedical sciences.
Prereq. Permission of the instructor.

BIO 271. Computer Programming

Lectures. *Two 2-hour sessions each week for the first two weeks of the "a" period.*

Laboratory. *10 hours each week for the first two weeks of the "a" period.* No credit is given for this course. Dr. Neff, Members of the Health Sciences Computing Facility.

An intensive, non-credit short course in computer programming in the FORTRAN language. Students without previous exposure to this language develop a working proficiency in it. Provides minimal skills in computer programming necessary to enter subsequent computing courses in the biostatistics curriculum.

BIO 273a,b. Introduction to Computing

Lectures. *Two 1½-hour sessions each week.*

Laboratory. *One 2-hour session each week. 5 units.* Dr. Pagano.

Introduces the fundamentals of computing, emphasizing algorithms, information flow, and the systematic design of programs in higher-level languages such as FORTRAN. Topics include: the structure of digital computers, programming languages, algorithm development and usage, systems of analysis, and systematic design of programs and computing systems.

Prereq. Previous programming experience, or concurrent enrollment in BIO 271.

BIO 274c,d. Statistical Computing

Lectures. *Two 1½-hour sessions each week.*

Laboratory. *One 1½-hour session each week. 5 units.* Dr. Pagano.

To be given 1982-83; offered alternate years. Enables students to understand, properly use, and possibly develop statistical algorithms or software. Topics are prompted by statistical procedures or biomedical applications, and include: computer arithmetic, error analysis, numerical techniques, equation solving, matrix operations, approximation and smoothing, optimization, and simulation modeling. Prereq. BIO 273a,b or equivalent, or permission of the instructor.

BIO 275c,d. Applied Data Management

Lectures, demonstrations. *Two 1½-hour sessions each week.*

Laboratory. *One 1½-hour session each week. 5 units.* Members of the Department.

To be given 1982-83; offered alternate years.

Introduces management of data, both external and internal, to computer data bases, concepts and techniques for handling data before it is ready for analysis, and practical aspects of computer data base design and usage. Topics include: data collection, forms and coding, data entry systems, quality control, data base structures (both logical and physical), data base management systems, file organization, and data models.

Prereq. BIO 273a,b or equivalent, or permission of the instructor.

BIO 310-315a,b,c,d. Tutorial Programs

Time and credit to be arranged. Members of the Department.

An opportunity for tutorial work is offered for interested and qualified students or small groups of students. Arrangements must be made with individual faculty members and are limited by the amount of faculty time available. These programs are open to students specializing in biostatistics and also to students in other fields who wish to go beyond the content of the regular courses. Six broad categories of this tutorial instruction are identified by the six course numbers below.

310 Statistical Methods

Guided study in specific areas of statistical methodology and application, including participation in the Departmental Journal Club.

311 Teaching

Work with the Department in laboratory instruction and the development of teaching materials.

312 Consultation

Work with members of the Department on current statistical consultation activities.

313 Computing

Guided study in scientific programming, numerical methods, and data management.

314 Study Design

Guidance in developing statistical design of a study in which the student has a particular interest.

315 Data Analysis

Guidance in the statistical analysis of a body of data in which the student is interested.

Students may register for BIO 310-315 for a maximum of five credit units in the summer term.

BIO 350. Research

Candidates for the Doctor of Public Health, Doctor of Science, or other doctoral degrees may arrange for individual research. The work may be part of the program for a doctorate in this Department or may be integrated with doctoral research in other departments.

Attention is directed to EPI 202b, 203c, 204d, and 205c,d, courses of interest to biostatistics students, descriptions of which are found under Epidemiology.

Environmental Health Interdepartmental Courses

The following courses are conducted by the faculty and staff of the Kresge Center for Environmental Health, which includes the Departments of Environmental Health Sciences, Physiology, Sanitary Engineering, and the Occupational Health Program.

EHl 201a, 201b. Principles of Environmental Health

Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Moeller.

Reviews the more important environmental health problems facing society. Topics in the "a" period (which is repeated during the "c" period) include: environmental physiology, radiation protection, air pollution control, and occupational health. Topics in the "b" period include: water purification, waste-water treatment, basic sanitation, insect and rodent control, traumatic injuries, toxicology, environmental law and economics, and the health implications of energy use. Topical coverage during the "d" period is similar to that for the "b" period but with emphasis on problems in the less developed countries. A term paper is required.

Note: Students in the M.P.H. Program are required to take this course. Such students have the option of taking the "a" and "b" periods, the "a" and "d" periods, the "b" and "c" periods, or the "c" and "d" periods. Because of the special orientation of the subject matter during the "d" period, it is suggested that students interested in environmental health problems in the less developed countries enroll in that period plus either the "a" or "c" period. Enrollment in the "b" period is recommended for students in the Department of Environmental Health Sciences.

EHl 204a,b. Human Factors in Ergonomics

Lectures, demonstrations. *One 2-hour session each week. 2 units.* Dr. Snook.

Emphasizes the design of the job to fit the worker. Specific problems are investigated which result from the nature of the job itself, e.g., low back injuries, fatigue, hand disorders, slips and falls, human error, and psychological stress. The physiological, psychological, and anatomical characteristics of the worker are considered in the development of good job design principles.

EHl 206a,b. Introduction to Occupational Medicine

Lectures. *One 2-hour session each week. 2 units.* Dr. Baker.

Reviews the diagnosis and management of occupational diseases following exposure to specific workplace substances, including asbestos, lead, beryllium, silica, and other substances. Methods of diagnosis of early organ system effects of chemicals and techniques for assessing disability will be considered. The course is limited to physicians or others with adequate training by permission of the instructor.

EHl 207a,b. Policy Issues in Occupational Health

Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Boden.

Examines the legal, economic, and political foundations of occupational health activities in the United States. Enables students to develop the knowledge and skills in the above areas necessary to apply medical, industrial hygiene, and statistical skills to achieve a healthful workplace. The roles of government, unions, corporations, and research organizations are discussed.

EHl 208c,d. Occupational Health and Safety—Law and Policy.

Lectures. *One 2-hour session each week. 2.5 units.* Dr. Mintz, Dr. Boden.

Analyzes the major legal issues that have arisen under the Occupational Safety and Health Act of 1970, as well as significant policy questions relating to the Act. Both specific legal decisions and broad legal policy questions will be covered, including the relationship of administrative agencies and the courts and the role of the Congress in overseeing implementation. Also covered are cost-benefit analysis; the concepts of significant and acceptable risk; and the role of enforcement strategies.

EHl 209c,d. Mathematical Modeling for Health Sciences

Lectures, discussions. *Three 1-hour sessions each week, "c" period; two 2-hour sessions each week, "d" period. 4 units.* Dr. Butler.

A range of models for the space and time dependence of the key variables in natural systems is discussed. Specific applications emphasize processes that characterize the response of the organism to its environment. The inverse problem of using measurements to infer estimates of parameters of models is developed.

Prereq. Calculus, PHY 203a,b, and statistics to the level of concurrent enrollment in BIO 202c,d, 205c,d, or 210a,b.

EHl 211a,b. Critical Review of the Scientific Basis for Occupational Standards

Seminars. *One 2-hour and one 1-hour session each week. 5 units.* Dr. Wegman, Dr. Baker, Dr. Smith.

Designed to provide students with the opportunity to review the scientific basis for the association of selected occupational exposures with disease. Special emphasis is placed on critical evaluations of the literature. Reviews occupational cancer and respiratory disease, pathophysiology of respiratory disease and epidemiologic approaches to chemical carcinogenesis. Attention will be directed specifically to the interface of science and regulatory standards.

Enrollment limited to 15.

Prereq. EPI 201a or 221a,b, BIO 101a,b, EHl 251c,d, or permission of the instructors.

EHl 251c,d. Basic Problems in Occupational Health and Industrial Environments (Engineering 282)

Lectures. *Two 2-hour sessions each week.*

Laboratory demonstrations, field trips. *One 3-hour session each week. 5 units.* Dr. Ferris, Dr. Baker, Mr. Burgess, Dr. Smith, Dr. Wegman. Lectures, laboratory demonstrations, and inspections of workplaces show the relation of working conditions to health, with special reference to the recognition, measurement, and control of hazards. Examples include adverse conditions of temperature, humidity, radiation, and chemical and physical irritants. Particular emphasis is given to the prevention, diagnosis, and treatment of industrial disability and disease.

Prereq. PHY 203a,b.

EHI 254b. Introduction to Industrial Hygiene
Lectures, seminars, laboratories. *One 2-hour session each week. 1.25 units.* Dr. Ellenbecker, Dr. Smith.

Intended for physicians, nurses, and other health professionals who will work with industrial hygienists in a variety of settings. Designed to familiarize these professionals with the methods used by the industrial hygienist in the prevention of occupational disease, thereby promoting a more effective working relationship. Topics include: the physical form of air contaminants, air sampling and analysis, engineering controls, and the preparation of survey protocols.

EHI 330e. Field Work

One-week period between fall and spring terms. 1 unit.

A week of supervised field observation is offered to students who may choose appropriate visits to medical or industrial hygiene departments of industries, airports, and other agencies which have operations or research in the field of environmental health. Field work arrangements are generally made early in the fall term.

Environmental Health Sciences

EHS 202a,b. Departmental Seminars

Seminars. *One 1-hour session each week. 1 unit.* Dr. Cooper.

Members of the Department present for discussion aspects of their current research in the "a" period; speakers from outside the Department present topics relating to the environment in the "b" period.

EHS 202c. Departmental Seminars

Seminars. *One 2-hour session each week. 1 unit.* Dr. Spengler.

In the "c" period, second-year master and doctoral students report on their research in progress.

EHS-HPM 211a. Introduction to Operations Management

Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Cooper, Dr. Evans.

Emphasizes quantitative and descriptive methods for decision making in environmental and health management. Serves as an introduction to operations management, planning, forecasting, optimization, and control.

EHS 213a,b. Occupational Safety Science (formerly EHI 213a,b)

Lectures, discussions. *Two 1-hour sessions each week. 2.5 units.* Dr. Keyserling.

Covers the fundamental principles of occupational safety science. Topics include: theoretical models of accident causation, accident investigation procedures, systems analysis, safety standards, safety performance measurement, and product safety. Emphasizes the use of engineering controls and administrative practices to alleviate workplace hazards.

EHS 252c. Environmental Control: Industrial Ventilation (Engineering 280)

Lectures. *Two 1-hour sessions each week.*

Laboratory. *One 3-hour session each week. 2.5 units.* Mr. Burgess, Dr. Ellenbecker.

Intended for industrial hygiene and air pollution students. Covers the design and evaluation of local exhaust ventilation systems for the control of toxic air contaminants released into the workplace by industrial operations and processes.

EHS 252d. Noise and Vibration Control (Engineering 280)

Lectures. *Two 1-hour sessions each week.*

Laboratory. *Four 3-hour sessions. 2.5 units.* Dr. Ellenbecker, Dr. Cudworth, Mr. Cavanaugh (Consultant in Acoustics).

Introduces the fundamentals of sound and vibration generation, transmission, and reception. Emphasizes the control of environmental noise hazards in industrial workplaces. Basic measurement instrumentation and techniques will be introduced with practical exercises. Noise hazard control methodology will be explored by means of lectures, demonstrations, and field trips to laboratories and industrial plants.

EHS 253a,b. Aerosol Technology (Engineering 286)

Lectures. *Two 1-hour sessions each week.*

Laboratory. *One 2-hour session each week, "a" period; one 4-hour session each week, "b" period. 5 units.* Dr. Hinds.

Covers the properties of suspended particulate matter (dust, smoke, clouds) and the physical principles underlying its behavior. Topics include: particle motion due to gravitational, thermal, and electrostatic forces; diffusion; impaction; coagulation; filtration; condensation and evaporation; optical properties; and sizing statistics. Laboratories cover optical and electron microscopy, sampling, and mass concentration and particle size measurement. Required for concentrators in industrial hygiene and air pollution control.

EHS 255a. Health Hazards of Manufacturing Processes

Lectures, field trips. *One 2-hour and one 3-hour session each week. 2.5 units.* Mr. Burgess, Members of the Department.

Deals with the recognition of health hazards in the workplace and the atmospheric environment, using a unit operations approach to manufacturing processes. Designed as an introduction to other courses which consider the evaluation and control of hazardous conditions in the workplace and atmospheric environment.

Enrollment limited to 30 and subject to approval of the instructor. Preference given to students in the Department of Environmental Health Sciences and the Occupational Health Program.

EHS 261d. Community Air Pollution
(Engineering 284)

Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Spengler, Dr. First.

Air quality standards; health effects; damage to animals, plants, and property; community and site surveys; the legal and enforcement aspects of air pollution control.

Prereq. EHS 255a, EHS 262b, EHS 264c,d (may be taken concurrently), or permission of the instructors.

EHS 262b. Meteorological Aspects of Air Pollution (Engineering 285)

Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Spengler.

Provides the student with a general understanding of the present status of local and long-range dispersion modeling. Also presents an evaluation of the meteorological factors associated with the transport, transformation, dispersion, and removal of air pollutants. Students will learn to recognize and define the parameters of elements in the atmosphere affecting pollutant dispersion and to calculate concentration fields downwind of pollutant sources.

Prereq. Knowledge of calculus.

EHS 264c,d. Identification and Measurement of Air Contaminants (Engineering 283)

Lectures. *Two 1-hour sessions each week.*

Laboratory. *One 1-hour session each week. 5*

units. Dr. Smith, Members of the Department. Emphasizes sampling and analytical methods for air contaminants plus related subjects. Included are: chemical and instrumental methods of air analysis, isokinetic sampling, biological and solvent analysis, radioactive aerosol determinations, air pollution surveys, and fire and explosion evaluations.

Required for concentrators in industrial hygiene, air pollution control, radiological health, and occupational safety programs.

EHS 265c,d. Air and Gas Cleaning
(Engineering 289)

Lectures. *One 2-hour session each week.*

Laboratory. *One 4-hour session each week. 5 units.* Dr. Leith, Dr. Ellenbecker, Members of the Department.

Theory, selection, application, and testing of gas-cleaning devices. Particle collection by inertial, centrifugal, electrostatic, and other forces; gas absorption in liquids, adsorption on solids, and incineration. Laboratory experiments illustrate principles involved.

Prereq. EHS 253a,b.

HPM-EHS 267a,b. Political Economy of Environmental Health Regulations

Lectures, discussions. *Two 2-hour sessions each week. 5 units.* Dr. Roberts, Dr. Repetto, Dr. Cooper, Dr. Thomas, Dr. Landy.

(Course described under Health Policy and Management.)

HPM-EHS 269c,d. Environmental Health Policy Analysis

Lectures, case discussions. *Two 2-hour sessions each week. 5 units.* Dr. Cooper, Dr. Thomas, Dr. Roberts.

(Course described under Health Policy and Management.)

EHS 271a,b. Introduction to Radiation Protection (Engineering 288)

Lectures, demonstrations. *One 2-hour and one 1-hour session each week. 5 units.* Dr. Shapiro, Dr. Moeller.

Covers laboratory, industrial, and environmental sources of radiation; the interaction of ionizing particles with matter; the concept of radiation dose from external and internal sources; radiation measurements; radiation protection standards and regulations; and methods of environmental and occupational radiation protection. (Students desiring laboratory experience in the use of radiation measuring instruments should enroll concurrently in EHS 272b.)

EHS 272b. Introduction to Radiation Instrumentation

Laboratory. *One 2-hour session each week. 1.25 units.* Dr. Shapiro.

Provides an introduction to the use of radiation measuring equipment and supplements the material presented in EHS 271a,b. Exercises cover radiation counting, gamma spectroscopy, and the use and calibration of radiation survey instruments. (This course is available to students in EHS 271a,b who desire laboratory experience in the use of radiation measuring instruments.)

Enrollment limited and subject to approval of the instructor.

Prereq. Previous or concurrent enrollment in EHS 271a,b.

EHS 273c,d. Concepts and Issues in Radiation Protection

Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Moeller, Dr. Shapiro.

Involves detailed study of current handbooks and publications related to radiation protection. Areas covered include the regulation of radiation use and the evaluation and control of radiation hazards. Specific topics include: regulatory guides and standards, safety evaluation reports, evaluation of operating experience, risk assessment and emergency planning.

A term report is required.

Prereq. EHS 271a,b and permission of the instructors.

EHS 274c,d. Radiation Protection in Medicine

Lectures. *One 2-hour and one 1-hour session each week.*

Laboratory. *One 3-hour session each week. Time to be arranged. 5 units.* Dr. Webster.

Covers the fundamentals of x-ray equipment, the design of x-ray installations, and procedures for radiation protection surveys and inspections. Included in the course are associated problems in nuclear medicine and teletherapy. Considerations include: equipment and room design, with emphasis on items such as leakage, collimation, filtration, primary and secondary barriers, contamination control, workload, and protection of patients.

EHS 301-306a,b,c,d,e. Tutorial Programs

Reading or research. *Time and credit to be arranged.*

Reading or research assignments for individual tutorial work at a master's degree level are provided for qualified students in the fields of industrial hygiene, industrial ventilation, aerosol technology, radiological health, medical radiation physics, nuclear medicine, solid waste management, air pollution control, and environmental health management.

301 *Air Pollution*

Dr. Cooper, Dr. First, Dr. Leith, Dr. Spengler.

302 *Industrial Hygiene*

Mr. Burgess, Dr. Ellenbecker, Dr. Hinds, Dr. Smith.

303 *Radiological Health*

Dr. Moeller, Dr. Shapiro.

304 *Medical Physics*

Dr. Bjarngard, Dr. Webster.

305 *Solid Wastes*

Dr. First.

306 *Environmental Health and Toxic Material Management*

Dr. Cooper, Dr. Moeller.

Enrollment subject to approval of the Chairman of the Department.

EHS 350-362. Research

Facilities of the Department are available for doctoral candidates and properly qualified second-year master's degree students to pursue independent research on problems in industrial hygiene, aerosol technology, solid waste management, air pollution control, and radiological health. Areas currently receiving study in the Department are as follows:

351 Dr. Smith

Evaluation of performance factors of respiratory protective devices; monitoring exposures of occupational groups to toxic air contaminants; ventilation control of airborne contaminants; evaluation and control of noise.

352 Dr. First

Application of gas- and liquid-phase reactions to particulate and gas removal; development and design of cleanup systems for airborne contaminants from industrial and nuclear power plant facilities; incineration of solid wastes including municipal, radioactive, biological, and laboratory materials.

353 Dr. Leith

Measuring and modeling the performance of industrial gas cleaning equipment; assessing the air pollution potential of simple and complex pollution sources.

354 Dr. Spengler

Personal exposure monitoring and modeling of air pollutants; risk analysis; health effects of air pollutants.

355 Dr. Cooper

Experimental and theoretical research in aerosol generation, measurement, behavior, and control; quantitative methods of environmental management.

356 Dr. Moeller

Reduction of population dose from sources of natural origin; environmental protection for nuclear facilities; radiation safety criteria and standards.

357 Dr. Hinds

Sampling and analysis of aerosol particles both in the ambient atmosphere and under laboratory conditions; generation of monodisperse aerosols; uses of aerosols in environmental health; development of particulate removal equipment.

358 Dr. Shapiro

Evaluation and control of hazards from radioactive contamination; radiation dosimetry.

359 Dr. Bjarngard

Medical radiation physics with emphasis on dosimetry, nuclear medicine, and radiation therapy.

360 Dr. Webster

Medical radiation physics with emphasis on survey techniques, instrumentation, and image quality and patient dose reduction in diagnostic radiology.

361 Dr. Keyserling

Prevention of overt and cumulative occupational trauma; evaluation of jobs for biomechanical and physiological stresses; computer modelling of human strength; ergonomic applications to job design.

362 Dr. Ellenbecker

Engineering control of occupational exposures; ventilation system design and evaluation; fundamental principles underlying the performance of air pollution control equipment.

Enrollment subject to approval of the Chairman of the Department.

The following courses, offered in the Harvard Faculties of Arts and Sciences and Government, and at the Massachusetts Institute of Technology, are open to qualified students from the School of Public Health and may be of interest to students of environmental health sciences.

Economics 1010c. Microeconomic Theory

Half course (*fall term*). M., W., F., at 11. Ericson. Prereq. Elementary calculus.

Economics 1011a. Microeconomic Theory and Policy Analysis

Half course (*spring term*). M., W., F., at 11. Kresge.

Economics 1551. The Political Economy of Environmental Quality

Half course (*spring term*). Tu., Th., at 12. Dorfman. Prereq. Social Analysis 10 or permission of instructor.

Natural Sciences 134. Technological Assessment

Half course (*spring term*). Tu., Th., at 10 and occasional discussion hours to be arranged. Brooks.

M-111. Analysis for Decision Making

Half course (*spring term*). M, W., 8:30-10. Ludo Van der Heyden.

S-482. Seminar: Science, Technology, and Public Policy

Half course (*spring term*). M., 2-4. Brooks, Cohen, Zinberg.

M.I.T. 1.143. Mathematical Optimization Techniques

Nine units (*spring term*). Hours to be arranged. D. H. Marks.

M.I.T. 1.146. Engineering Systems Analysis

Nine units (*fall term*). Tu., Th., 10:30-12. DeNeufville *et al.*

M.I.T. 1.811. Environmental Law: Pollution Control

Nine units (*fall term*). Tu., Th., 4-5:30. Ashford and Heaton.

M.I.T. 1.812J. Regulation of Health and the Environment: Selected Topics
Nine units (*spring term*). Hours to be arranged. Ashford and Heaton.

M.I.T. 14.121. Microeconomic Theory I
Six units (*fall term*). M., W., 10:30-12 (*first half term only*). Solow and Fisher.

M.I.T. 15.065. Decision Analysis
Nine units (*fall and spring terms*). Tu., Th., 10:30-12. Kaufman.

M.I.T. 15.081J. Introduction to Mathematical Programming
Twelve units (*fall and spring terms*). Tu., Th., 2:30-4. Magnanti and Mitter.

M.I.T. 22.37. Environmental Impact of Electric Power Production
Twelve units (*spring term*). Golay.

Epidemiology

Note: Either EPI 201a or EPI 221a,b satisfies the requirement of an introductory course in epidemiology. However, individual programs may require one or the other.

EPI 201a. Introduction to Epidemiology

Lectures and seminars. *Two 1-hour and one 2-hour sessions each week. 2.5 units.* Dr. Morrison.

An introduction to epidemiology as a research discipline. Emphasis on basic epidemiologic principles and methods, with some description of the patterns of disease prevailing in the United States. This course leads into EPI 202b and is recommended for all students who wish to take more than the minimum School requirement in epidemiology. Students should feel comfortable with simple algebra. Credit cannot be received for both this course and EPI 221a,b.

EPI 202b. Principles of Epidemiology I: Elements of Study Design and Data Analysis

Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Rothman.

For students at the master's level who wish to acquire a familiarity with epidemiologic methods. The principles of study design and data analysis are presented with examples and exercises. The emphasis is on practical rather than theoretical issues. May serve as an introduction to more advanced study or as a final course for those desiring a working familiarity with epidemiologic methods.

Prereq. Knowledge of calculus and EPI 201a or permission of the instructor.

EPI 203c. Principles of Epidemiology II: Problem Conceptualization and Study Design

Lectures. *Two 2-hour sessions each week. 4 units.* Dr. Miettinen.

The course covers in a rigorous fashion the objects of epidemiologic research and the goals, options, and decision principles in study design. Intended for students preparing for a research career.

Prereq. EPI 202b or permission of the instructor.

EPI 204d. Principles of Epidemiology III: Data Analysis and Inference

Lectures. *Two 2-hour sessions each week. 3 units.* Dr. Miettinen.

The course covers in a rigorous fashion the principles of hypothesis testing and estimation in epidemiologic research. Intended for students preparing for a research career.

Prereq. BIO 202c,d or 205c,d and EPI 202b, or permission of the instructor.

EPI 205c,d. Practice of Epidemiology

Tutorials, seminars. *Tutorial sessions during "c" period; one 2-hour seminar each week during "d" period. 2.5 units.* Dr. Rothman, Dr. Gutensohn, Dr. Walker.

The seminars consist of student presentations of plans for and analyses of epidemiologic data, with discussion by students and faculty. Preparatory work is done under tutorial arrangements with members of the faculty. For the analyses, the emphasis will be on conceptual issues and not on execution.

Prereq. EPI 202b and permission of the instructor. Enrollment limited to 16 students.

EPI 206c,d. Topics in the Theory of Epidemiology

Lectures. *One 2-hour session each week. 2.5 units.* Dr. Hutchison, Members of the Department.

For students who expect to conduct epidemiologic research. Consists of lectures on topics that are not part of the basic methodology covered in other courses in the Department. Topics include: sampling, factors affecting response, data handling, analysis of time-place clustering, cyclic variation, survival, and problems of distinguishing genetic and environmental components of a disease.

Prereq. EPI 201a or 221a,b and BIO 101a,b, or equivalent.

EPI 211c. Epidemiology of Chronic Disease

Lectures. One or both modules may be taken.

Psychiatric Disorders *One 2-hour session each week. 1.25 units.* Dr. Klerman.

Surveys recent development of standardized methods for psychiatric case diagnosis and their application to the epidemiologic study of specific disorders. Emphasis will be given to schizophrenia, depression and affective disorders, alcoholism, drug abuse, emotional problems in children, and psychiatric disabilities in the aging.

Cancer and Screening *One 2-hour session each week. 1.25 units.* Dr. Morrison.

A review of the epidemiology of cancer of several sites, and of population screening for cancer. Radiation carcinogenesis, and the natural history of "pre-malignant lesions," also will receive attention.

EPI 211d. Epidemiology of Chronic Disease: Cardiovascular and Respiratory Disease

Lectures. One 2-hour session each week. 1.25 units. Dr. Hutchison.

A review of the epidemiology of the chronic cardiovascular and respiratory diseases. Demographic distribution and time trends of these diseases are presented, and known risk factors are discussed.

EPI 212c,d. Environmental and Occupational Epidemiology

Lectures, seminars. One 2-hour session each week. 2.5 units. Dr. Monson.

This course has three objectives: (1) to review methods used in evaluating the health effects of physical and chemical agents in the environment, (2) to review available evidence on the health effects of such exposures, and (3) to consider policy questions raised by the scientific evidence. Includes lectures on methodology, seminars on the review and criticism of current literature, and presentations by outside experts on the evaluation and impact of epidemiologic data.

Prereq. EPI 201a or 221a,b and BIO 101a,b.

NUT-EPI 213a,b. Nutritional Epidemiology

Lectures. One 2-hour session each week. 2.5 units. Dr. el Lozy, Dr. Willett, Mrs. Witschi. (Course described under Nutrition.)

EPI 221a,b. Epidemiology in Public Health

Two 1-hour lectures, alternating with one 1-hour lecture, one 2-hour seminar. 2.5 units. Dr. MacMahon, Dr. Gutensohn.

The place of epidemiology in public health and disease control. Basic epidemiologic principles and methods, and their application to public health problems will be dealt with at an introductory level. Recommended for students who do not plan to take more than the minimum School requirement in epidemiology. Students who plan to take advanced epidemiology courses should take Epidemiology 201a rather than Epidemiology 221a,b.

EPI 300a,b,c,d,e. Tutorial Programs

Time and credit to be arranged.

Students may participate in departmental research in close association with a staff member. Time and credit are to be arranged with the Chairman of the Department.

EPI 350. Research

In selecting topics for research in doctoral programs, students should consider the fields in which members of the Department are currently working. These include:

Neoplastic Disease

Dr. MacMahon, Dr. Gutensohn, Dr. Hutchison, Dr. Monson, Dr. Morrison, Dr. Rothman, Dr. Walker.

Congenital Malformation

Dr. MacMahon, Dr. Miettinen, Dr. Rothman, Dr. Yen.

Cardiovascular Disease

Dr. Rothman, Dr. Miettinen.

Effects of Contraceptive Agents

Dr. Rothman.

Environmental Epidemiology

Dr. Monson.

Statistical Methods

Dr. Miettinen.

Nutritional Epidemiology

Dr. Willett.

Virus-associated Chronic Disease

Dr. Gutensohn.

Health Policy and Management

HPM 100a,b. Policy I: Economic Analysis

Lectures, seminars. Three 2-hour sessions each week. 7.5 units. Dr. Hemenway.

Designed to bring students to an intermediate-level understanding of economic theory. Emphasizes the uses and limitations of the microeconomic approach.

Required for students in the Health Policy and Management Program.

May be taken for credit by students who previously have taken HPM 205a,b only with permission of the instructor.

HPM 205a,b. Economic Analysis for Public Health

Lectures, discussions. Two 1½-hour sessions each week. 5 units. Members of the Department.

Provides an introduction to the basic principles of economics and economic analysis, particularly as they apply in the public health field. A systematic introduction to microeconomic theory includes the determinants of supply and demand, the theory of markets, and the concept of economic efficiency. In addition, attention is given to public expenditures and policy analysis.

May not be taken for credit by students enrolled in the Health Policy and Management Program or by students who previously have taken HPM 100a,b.

HPM 207c,d. Economics of Health Policy

Lectures, discussions. Two 1½-hour sessions each week. 5 units. Mr. Hsiao.

Applies economic analysis to planning and regulation of health programs. Application is emphasized over theory. Examines planning and regulation in a market economy and develops analytical tools, including systematic analysis, econometrics, modeling, simulation, and cost-benefit analysis. Health policy topics include: national health insurance, health manpower, resource allocation, and hospital facilities. Skills in using analytical techniques appropriately are developed. Course especially appropriate for students who intend to pursue a career in planning and evaluation of health programs.

Prereq. One semester each of statistics and microeconomics.

EHS-HPM 211a. Introduction to Operations Management

Lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Cooper, Dr. Evans.

(Course described under Environmental Health Sciences.)

HPM 211c. Policy II: Quantitative Policy Analysis

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Thompson.

Introduces students to techniques for analyzing health problems quantitatively. Techniques include decision analysis and benefit-cost analysis. Readings from health policy and management literature are used to illustrate the techniques and their limitations.

Required for students in the Health Policy and Management Program.

BIO-HPM 212a. Forecasting and Its Use in Health Programs and Institutions

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Reed, Members of the Departments of Biostatistics and Health Policy and Management.

(Course described under Biostatistics.)

HPM 213d. Introduction to Operations Research

Lectures, discussions. *Two 1½-hour sessions each week. 2.5 units.* Members of the Department.

Presents some of the basic models of operations research. Techniques include linear programming, queueing theory, simulation, and PERT/CPM. The purpose is to provide students with motivation to analyze health care problems quantitatively. Readings from health policy and management literature are used to illustrate the various techniques.

Prereq. HPM-BIO 219b,c, 219d or equivalent.

BIO-HPM 215b. Health Program Evaluation

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Thompson.

(Course described under Biostatistics.)

HPM-BIO 216c. Analysis of Health and Medical Practices (Public Policy S-176m)

Lectures, discussions. *Two 1½-hour sessions each week. 2.5 units.* Dr. Weinstein.

Concerns the analysis of clinical procedures and health programs, and examines uses and limitations of quantitative methods such as decision analysis and cost-benefit analysis. Top-

ics include: resource allocation in the management of hypertension, treatment decision for acute abdominal pain, diagnosis of renovascular disease, screening for glaucoma, and coronary artery bypass surgery. Implications for quality assurance and medical reimbursement policies are considered.

Prereq. Some facility with quantitative methods, preferably with some elementary knowledge of statistics, decision analysis, or economics.

HPM 217a. Decision Analysis and Evaluation

Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Thompson.

Provides an overview of important, recent developments in decision analysis and benefit-cost analysis and of their applications to policy and evaluation problems in health. Emphasizes the appropriate use of analytic techniques for decision making, recognition of their short-comings and limitations, and their role in program evaluation. Topics include: discounting, evaluation planning, measurement of health status, multi-attribute decision making, multi-person decision making, sample size determination, and willingness to pay. HPM 211c or HPM 216c helpful, but not necessary.

HPM 218d. Seminar on Clinical Decision Analysis

Seminar. *Two 2-hour sessions each week. 2.5 units.* Dr. Fineberg, Dr. Weinstein.

Intended to enhance the student's ability to conduct independent analyses of medical decisions. Didactic sessions will critically review published analyses and address selected topics, such as evaluation of diagnostic tests, utility assessment, and use of computer aids. Presumes knowledge of principles of decision analysis.

Prereq. HPM 211c or HPM-BIO 216c, or permission of instructor.

HPM-BIO 219b,c, 219d. Statistical Methods for Health Policy and Management

Lectures. *Two 2-hour sessions each week. "b,c": 5 units; "d": 2.5 units.* Dr. Lavin, Dr. Mehta.

"b,c": Introduces students to statistics and probability emphasizing their application in a variety of health policy and management contexts. Goals include establishing an awareness of basic statistical reasoning and recognition of common difficulties in application. Topics include: distributions, data display, sensitivity,

specificity, life tables, representative sampling, confidence intervals, experimental design, standardization, p-values, power, sample size determinations, testing means and proportions, contingency tables, goodness of fit tests, rate adjustment, simple regression, correlation, and prediction.

"d": Promotes facility with data analysis using regression and time series techniques of analysis with the MINITAB package. Topics include: multiple regression, discriminant analysis, forecasting, and analysis of categorical data. Both the "b,c" and "d" sections are required for students in the Health Policy and Management Program.

May not be taken for credit by students who previously have taken BIO 101a,b.

Prereq. One college-level course in mathematics. Enrollment of students not in Health Policy and Management Program subject to approval of the instructors. HPM-BIO 219b,c may be taken separately and is a prereq. for HPM-BIO 219d.

HPM 220a,b/220c,d. Administrative Systems

Lectures, seminars. *Three 2-hour sessions each week. 5 units each semester.* Dr. Barrett, Members of the Department.

Examines issues related to managing health care organizations and develops skills in a variety of functional areas, including: organizational theory, institutional strategy, leadership, change and conflict, personnel and labor relations, financial accounting and analysis, cost accounting, operations management, marketing and management control systems. Classes rely principally on the case method of instruction.

Required for students in the Health Policy and Management Program.

May be taken for credit by students who previously have taken HPM 221a,b.

Prereq. HPM 220a,b or equivalent by permission of the instructor if HPM 220c,d taken separately.

HPM 221a,b. Administration of Health Services

Case discussion and lectures. *Two 2-hour sessions each week. 5 units.* Members of the Department.

An introduction to the major topics of general management of health organizations. Focuses on organizational behavior and design, marketing, finance and control, and strategy. The goal is to explore the analysis of managerial problems and to evaluate alternative solutions, applying relevant managerial concepts and theories.

Required for students in the M.P.H. program. May not be taken for credit by students enrolled in the Health Policy and Management Program or by students who previously have taken HPM 220a-d.

HPM 222a,b. Administration of Personal Health Services

Seminars, field projects. *One 2-hour session each week. 2 units.* Dr. Kasten.

Designed for students who will be administrators of personal health service programs. Inpatient, ambulatory, home, and rehabilitation programs are treated from an operational and preventive perspective. Special emphasis is placed on administrative problem solving. Students analyze administrative problems in operating personal care service programs. Enrollment limited to 16 and subject to approval of the instructor.

HPM 223a,b. Personnel and Labor Relations

Case discussions. *Two 2-hour sessions each week. 5 units.* Dr. Barrett, Dr. Hobart.

Utilizes cases plus a text and places approximately equal emphasis on union-management and personnel topics. Labor and personnel topics are integrated. Labor elements of the course emphasize the grievance, arbitration, and negotiation processes including a negotiation exercise. Personnel concentrates on intellectually challenging topics including social legislation. Available health care cases will be utilized.

HPM 225d. Health Care Operations Management

Lectures, case studies, discussions. *Two 1½-hour sessions each week. 2.5 units.* Members of the Department.

The objective is to familiarize students with a variety of operating systems in a health care environment and to present significant issues related to the types of decision situations a health care manager faces in practice. Subjects include: labor productivity monitoring, resource management, information systems evaluation, materials management, nursing staffing, elective admissions scheduling, operating room scheduling, and hospital drug distribution systems.

Prereq. Basic course in statistics or quantitative methods, or permission of the instructor.

HPM 233b. The Management of Organizational Design and Change

Lectures, case presentations, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Barrett.

Examines various models of organizational diagnosis in order to understand the way in which complex health care organizations function. Considers change within the framework of different climates, functions and strategies and assesses different models of change that might be used by managers and policy makers.

Prereq. HPM 220a-d or knowledge of basic issues of organizational behavior. Enrollment limited to 20 and subject to approval of the instructor.

HPM 234a. Management Control Systems

Case studies. *Two 2-hour sessions each week. 2.5 units.* Dr. Young.

Builds on the skills and techniques covered in the financial accounting, cost accounting, and management control system modules of HPM 220 a,b,c,d. The material covered is more advanced than that in HPM 220 and should be of interest to students pursuing careers in management. Uses case method instruction primarily, supplemented by topical readings. Topics include: financial accounting, full and differential cost analysis, budgeting and management control systems. The principal focus is on institutions, although some material has a public sector orientation.

Prereq. HPM 220a-d or equivalent.

HPM 235d. Seminar on Hospital Cost Containment

Seminar. *One 3-hour session each week. 1.25 units.* Dr. Herzlinger, Dr. Kane.

Designed to be a state-of-the-art, holistic review and analysis of all factors involved in containing hospital costs: providers, intermediaries, regulators, planners, employers, unions, and consumers. First half of class session will be a discussion of relevant literature; second half will be a series of presentations/interactions with outside representatives of specific cost containment efforts.

HPM 236d. Planning in the Hospital Setting

Lectures, seminars. *Two 1½-hour sessions each week. 2.5 units.* Dr. Trevelyan, Ms. Bander.

Designed to acquaint students with the concepts and strategies of planning in the hospital setting. Offers practical understanding of the current status and potential application of organized planning efforts in the modern hospital. Environmental issues explored as well as the status of and outlook for multi-institutional planning endeavors. Special emphasis placed upon the perspective and approach of the organization.

Enrollment subject to approval of the instructors.

HPM 237c. Financial Management in Health

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Young, Mr. Hourihan.

Concerned with management of the flow of funds through a health organization. Makes use of data supplied by the accounting system to help organizations make rational resource allocation decisions. Focuses on several techniques required for effective short- and long-term financial management. Takes the perspective of manager, although some attention will be given to understanding the financial environment, including capital markets.

Prereq. HPM 220a-d or HPM 221a,b or equivalent.

HPM 238c. Introduction to Management Information Systems

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Young.

Examines basic principles relating to the effective use of computer-based information systems in organizations. Although some technological issues are addressed on occasion, the principal focus of the course is on topics of analysis, design, implementation, and control, rather than technology. The course addresses MIS issues in non-profit organizations, with several classes devoted to health-related organizations.

Prereq. Some knowledge of computer technology and either HPM 220 a-d or HPM 221 a,b.

HPM 240a. Agenda for U.S. Public Health

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Fineberg, Guest Lecturers.

Provides students with a common framework for the study of public health issues. Conceptual history and contemporary notions of health and the field of public health introduce the course. Various analytic approaches to identifying public health problems, and the strengths, biases and weaknesses of each are described in the context of topics that include: determinants of health problems and potential solutions, setting program priorities and measuring results, and research objectives in public health.

Required for students in the Health Policy and Management Program.

HPM 240c,d. The Health Care Delivery System

Lectures, discussions. *Two 2-hour sessions each week. 5 units.* Members of the Department.

Examines major health care delivery issues, and the development and implementation of policies and programs designed to address them using several frameworks including that of economic analysis. Topics include: health manpower, health care finance, health planning and regulation, new medical technology, and the supply of and demand for medical care facilities.

Required for students in the Health Policy and Management Program.

Prereq. HPM 100a,b, HPM 205a,b, or equivalent with permission of the instructor.

HPM 243b. Health Systems Planning and Regulation

Lectures, seminars. *Two 1½-hour sessions each week. 2.5 units.* Dr. Roberts, Ms. Schaufler.

Provides an overview of area-wide health planning and regulation as performed by health planning agencies created under PL 93-641. Includes instruction in health planning and review techniques used in health planning and regulation through seminars, case studies, student projects, and field visits. Also covers the purposes and history of area-wide health planning and regulation, and the current structures and functions of health planning agencies.

Prereq. Background in economics and quantitative methods, planning experience desirable. Enrollment limited to 15 and subject to approval of the instructor.

HPM 245c. Design and Implementation of Health Care Regulation

Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Feldman.

Analyzes the policy choices which are inherent in government programs intended to change the behavior of health care providers. Cases are drawn primarily from planning and regulatory programs at the federal and state levels in the United States.

HPM 250d. Policy III: Policy Implementation

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Thomas.

Intended to help students think systematically about some of the reasons public programs succeed or fail. It assumes that the choice of appropriate and effective institutional arrangements for accomplishing policy goals is itself an important policy question. Examples are taken from a variety of policy areas.

Required for students in the Health Policy and Management program.

Presumes knowledge of material presented in HPM 100ab and HPM 211c.

HPM-MCHA 252a,b. Human Rights in Health

Lectures. *One 2-hour session each week. 3 units.*

Dr. Curran.

Entails a comprehensive examination of human rights as they bear upon health programs, nationally and internationally. Among topics considered from ethical, cultural, and legal viewpoints are rights to medical care and a healthy environment, equality, rights of medical patients, women, children, and experimental subjects, and problems of balancing personal rights and community protection. Enrollment limited. Auditing and convenience attendance not permitted.

HPM 253e. Government and Private Funding for Research and Health Care Programs

Lectures, discussions, workshops. *To be arranged. 1 unit.* Members of the Department.

To carry out research or develop needed health care programs, managers and policy analysts need to be able to obtain funding from federal, state, and local sources, and from foundations and corporations. This course aims to enable participants to demonstrate in a clear and concise proposal an understanding of the issues and facility with methodological design, and to explore potential sources of funding. Requirements for proper administration of funds are also discussed. Proposals are prepared and critiqued in the workshops.

Prereq. Exposure to research issues in health care or program development and permission of the instructor.

HPM 255d. Reimbursement Systems

Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Kane.

Examines issues related to the general theme of third-party reimbursement for health care institutions. The principal focus is on hospitals. Issues include: cost containment efforts, hospital perspectives, and the role of incentives. Some specific systems are examined in detail in order to assess the feasibility of certain techniques and to address questions of overall reimbursement system design.

HPM 257a. Quality Assurance in Health Services

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Palmer, Visiting Lecturers.

Examines issues in defining "quality in health care" and the choice of methods for assessing and improving quality of health care. Recent

research is reviewed and currently operating programs, including PSROs, are analyzed. Presentation includes case materials from quality assurance programs in both hospital and ambulatory settings.

Course is followed by the optional sequel HPM 257b.

HPM 257b. Physician Performance:

Facilitators and Constraints

Seminars, case discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Palmer.

Examines circumstances and programs which facilitate or constrain quality of physician performance. Issues discussed include public expectations of physician performance, inherent task constraints, cost-tradeoffs, effect of practice setting and specialization, selection, education, licensure, and specialty certification of physicians, malpractice and risk management, impaired physician programs, and utilization review programs. Examples of actual cases will be discussed.

Enrollment limited to 20 and subject to approval of the instructor. Experience in medical care delivery an advantage, but not required.

HPM-POP 262c,d. Health Planning in Developing Countries

Lectures, seminars. *Two 2-hour sessions each week.*

Laboratory. *One 1-hour session each week (optional). 5 units.* Dr. Cash, Dr. Shepard.

Deals with skills needed for health planning through lectures, seminars, and case studies. Strong emphasis is placed on the economic analysis of health issues in developing countries. Selected concepts and techniques of political analysis, microeconomics, cost effectiveness and cost benefit analysis, and projection of recurrent costs are presented and applied to health care programs. These techniques are then incorporated into a health planning context in analyzing selected health plans and in writing portions of a health plan. Emphasizes practical and applied work.

ID 209a,b or experience in developing countries is recommended, but not required. A background in economics is not required.

POP-HPM 263c, 263d. Case Studies in the Design and Management of Population and Health Programs

Case discussions, seminars. *Two 2-hour sessions each week. 2.5 units each period.* Dr. Wyon, Dr. Ewbank, Dr. G. Berggren, Members of the Department.

(Course described under Population Sciences.)

HPM 264c,d. Health and Social Welfare Systems in Cross-National Perspective

Lectures, seminars, case discussions. *Two 2-hour sessions each week. 5 units.* Dr. Dieter Koch-Weser (Associate Professor of Preventive and Social Medicine, Harvard Medical School), Dr. Field.

Modernization and industrialization have affected the health and economic security of individuals and families. Cyclic unemployment, industrial accidents and disease, temporary and permanent disability, and the social and financial deficits of old age are among the problems of modern nation states. The course examines the mechanisms that have evolved in different societies to ameliorate these hazards. The interrelatedness of health and social welfare programs and services is explored.

HPM 265d. The Health Maintenance Organization: Exploring an Alternate Care System

Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Young, Ms. Phillips.

Recent national concerns with improving health care and reducing the costs of care have promoted the HMO as an alternative care system. This course focuses on the development and management of prepaid group practice model HMO plans. The course reviews the organizational, political, and historical context of HMOs, examines problems and principles in the management of prepaid group practice (closed-panel) HMOs, and reviews health policy in relation to the HMO growth and success. The students, working in groups, will prepare proposals for the organizational, marketing, financial, and delivery programs of a newly developing HMO and will prepare relevant cases in business management.

Enrollment limited to 20 students and subject to approval of the instructor.

HPM-EHS 267a,b. Political Economy of Environmental Health Regulation

Lectures, discussions. *Two 2-hour sessions each week. 5 units.* Dr. Roberts, Dr. Repetto, Dr. Cooper, Dr. Thomas, Dr. Landy.

Examines the circumstances under which governmental intervention is appropriate to protect human health and the environment. Focuses on the likely consequences of choosing one or another regulatory strategy to reach specific environmental health objectives.

Required for students in the Health Policy and Management Program Environmental Track.

HPM-EHS 269c,d. Environmental Health Policy Analysis

Lectures, case discussions. *Two 2-hour sessions each week. 5 units.* Dr. Cooper, Dr. Thomas, Dr. Roberts.

Using the case method, demonstrates the application of analytic and technical skills to actual policy situations. The multidisciplinary approach will emphasize the technical uncertainties and the evaluative and institutional complexities surrounding environmental policy issues. Policy questions will be considered in an organizational context permitting students to consider the uses and limitations of formal methods of analysis.

Prereq. Previous coursework in policy, management, or environmental health sciences. Required for students in the Health Policy and Management Program Environmental Track.

HPM 272d. Issues in Mental Health Policy

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Benjamin Liptzin (Assistant Professor of Psychiatry, Harvard Medical School).

Examines major policy issues in mental health and approaches to analyzing them. Among the topics covered are: community mental health, de-institutionalization, financing, mental health manpower, health/mental health interface, and legal issues.

Prereq. Familiarity with mental health problems and programs desirable.

HPM 275a,b. Dental Public Health Practice
Seminars, field visits. *One 2-hour session each week. 2.5 units.* Dr. Yacovone.

Provides in-depth training in the administration and planning of dental health programs. Subjects include: community needs, resources, surveying, fluoridation, prepayment, and program evaluation. Each student develops a program plan in a specific area of community dental needs and presents the plan to the class.

HPM 276c,d. Dentistry and Social Policy
Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Yacovone.

Investigates relationships between the social sciences and dentistry. Subjects include: the role of the social sciences in dentistry, psychosocial interaction of doctor and patient, client perceptions of dentistry, interpersonal relationships in group practice, and the sociopolitical influence of dentistry as an organization.

HPM 300a,b,c,d,e. Tutorials

Time and credit to be arranged.

Students may make individual arrangements to do work under the guidance of a member of the department. This work may include readings or special projects.

HPM 330. Field Work

Time and credit to be arranged.

Students are assigned to work on special projects such as group surveys, other types of field projects, or observation of and limited participation in the work of health agencies. Field assignments are made on an individual basis to meet the needs of each student insofar as possible. Work in the field is coordinated with courses in the Department.

332 *Community Health Improvement Project*

Summer full-time or weekly part-time placement in local communities.

Credit to be arranged.

HPM 350. Research

Doctoral candidates may register for HPM 350 to undertake individual study and research.

Attention is directed to ID 201a,b and 201c,d, courses of interest to Health Policy and Management students and described under Interdepartmental Courses.

Maternal and Child Health and Aging

MCHA 101a. Child Growth and Development

Lectures, self-instructional material. *Two 2-hour seminars/lectures weekly. 2.5 units each period.* Dr. Valadian, Dr. DeLollis.

Instruction in the physical growth, development, and maturation of children is presented in programmed, self-instructional material, and by weekly lectures. Covers topics necessary for the advanced study of growth and development, but also provides an understanding of assets and needs particular to the MCHA population which constitute a basis for health services. Designed for MCHA students who do not have a strong background in physical development, but may also be taken by health providers who wish to refresh their knowledge.

MCHA 201b. Child Growth and Development II: Advanced Seminar

Seminars. *One 2-hour session each week. 1.25 units.* Dr. Valadian, Dr. DeLollis.

Describes and integrates the characteristics of human growth and physical development which occur during the selected life stages from conception to maturation. Intended for students with special interest in human development. Considers implication of child growth and development of these periods for health services and further research.

Prereq. MCHA 101a or permission of the instructor.

MCHA 201c. Child Growth and Development III: Factors Affecting Growth and Development

Lectures, seminars. *One 2-hour session each week. 1.25 units.* Dr. Valadian, Dr. DeLollis.

Explores definable influences that act on the course of physical growth and development from conception to maturity. Emphasis is placed on understanding the nature of the factor and its direct effects, as well as on how factors interrelate to produce some characteristics of mature individuals. This course also considers implications of factors for planning and providing health services and for future research.

Prereq. MCHA 101a or permission of the instructor.

MCHA 202e. Primary Maternal and Child Health Care

Seminars, lectures, field visits. *Full-day sessions. 1.25 units.* Dr. Gardner, Members of the Department.

Introduces the student to principles of organization and administration of primary health care services for mothers and children. Concepts of primary care, neighborhood health centers and quality assurance are presented. Seminars focus on the issues and problems presented in the field visits. The community programs selected are diverse, including neighborhood health centers, private practice, hospital primary care, and university health care.

MCHA 203a,b. Content of Maternal and Child Health Services

Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Gardner, Members of the Department, Guest Lecturers.

Components of health care services to mothers and children are discussed as they vary to meet the changing needs resulting from growth and maturational processes. Health services appropriate to maternity, early and late childhood, adolescence, and youth are presented in terms of the multidisciplinary and interdisciplinary action they require.

Prereq. MCHA 101a or permission of the instructor.

MCHA 204c,d. Programs and Issues in Maternal and Child Health Services

Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Valadian, Dr. Russell, Members of the Department, Guest Lecturers.

Beginning with the historical background and the relationship of maternal and child health programs to social, mental health, education, and other systems, the course discusses factors which shape current and future maternal and child health policies and services. It considers the organization and administration of national, state, and local health services for mothers, infants, children and adolescents and services for children with handicapping conditions. Selected issues are examined such as developmental disorders, Sudden Infant Death Syndrome, day care, school health. Emphasis is placed in financing, planning and evaluating MCH Services.

Prereq. MCHA 201b and 203a,b or permission of the instructor.

MCHA 205d. Research Approach to Growth, Development, and Health of the Child

Seminars. *Two 2-hour sessions each week. 2 units.* Dr. Valadian, Dr. Reed.

Methods of obtaining and evaluating data on child growth, development, and health, and the construction of norms are studied, including the design of studies dealing with interrelationships among various aspects of the child's progress, background, and environment.

Enrollment subject to approval of the instructors.

MCHA 206c,d. Maternal and Child Health in Developing Countries

Seminars. *One 2-hour session each week. 2.5 units.* Dr. Valadian.

Using readings, discussions, and case presentations, considers issues of high priority in the health of mothers and children in developing countries, placing particular emphasis on the interactions between health and poverty in societies in rapid social and cultural transition. Complements, but is not a substitute for, the issues raised in ID 209a,b. Considerable reading is required to fulfill the course objectives.

MCHA-NUT 207c,d. Nutrition in Child Growth and Development

Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Dwyer.

Principles and practical problems encountered in the nutritional aspects of child growth and development are examined. Lectures on general principles are designed to help students base their judgments on scientific evidence. Discussions deal with a variety of nutrition case studies and simulations illustrative of problems in both developing and highly industrialized countries.

MCHA 208d. Rural Health Services

Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Hayes.

Lectures and discussions focus on the special problems of rural communities impacting on MCH services delivery, cultural characteristics, resources available (using Mississippi as a major example) and innovative approaches to problems, with selected examples and case studies. Topics include transportation problems, environmental health hazards, and rural health in developing countries. Students will be asked to report on areas of particular interest.

MCHA 209c, 209d. Social Services for Mothers and Children

Lectures, seminars. *Two 2-hour sessions each week. 2.5 units each period.* Dr. Deykin.

Services for children and families are examined in terms of welfare legislation and the social factors that delineate their needs. Factors pertinent to the utilization of established programs and the newer self-help groups are discussed. The "c" period focuses on services for children including social services for the hospitalized, the seriously injured and the terminally ill child and his family, and foster home placements and adoption. The "d" period concentrates on services for adolescents and mothers including programs related to addiction, pregnancy, and battered women.

MCHA 210a. An Introduction to Personality and Cognitive Development

Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Walker.

The basic principles of child growth and development in the cognitive and the psychosocial domains are examined in this introductory course. Special emphasis placed on understanding the theories and research of Piaget, Freud, Erikson, and others, as well as the implications of these contributions to the planning and implementation of medical and/or related social and educational services for children and youth.

MCHA 211b. Health Care of Women

Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Gardner.

Considers critical issues of health care and the common problems of women, including the changing role of women in contemporary United States society. These health problems are addressed in terms of their epidemiology and the impact of technology on the detection and treatment of these problems viewed from biological, medical, behavioral, and legal perspectives.

Enrollment limited to 20 students.

MCHA 214a,b. The Elderly Person in the Health Care System (HMS Geriatrics 702)

One 3-hour session each week. 2.5 units. Dr. Lawrence Branch (Assistant Professor of Preventive and Social Medicine, Harvard Medical School).

Uses a variety of public health perspectives to analyze the health needs of the elderly and services to meet them. Topics include: demographic background of the "graying" of America, normal and pathological aging processes, epidemiology of geriatric illness, design and administration of present alternative forms of long-term care, and cross-national perspectives.

MCHA-BEH 237c,d. Child Development and Social Policy (Education P-220)

Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Walker.

Analyzes how knowledge of child development relates to the planning and implementation of social policy. Of primary concern are the relevance and utility of basic data from research and evaluation studies in psychology, pediatrics, and related disciplines in the creation of health and education programs and policies concerned with children and adolescents.

Prereq. Knowledge of basic child development and of research methodologies and statistics.

HPM-MCHA 252a,b. Human Rights in Health

Lectures. *One 2-hour session each week. 3 units.* Dr. Curran.

(Course described under Health Policy and Management.)

MCHA 300. Tutorials

Time and credit to be arranged.

Students at the master's level may arrange to work individually or in small groups under the guidance of a faculty member. The work may include participation in departmental research, specialized readings, field projects in a local or state health agency, or small studies to examine more in-depth topics introduced in various courses such as: planning and evaluation of MCH services for children with handicapping conditions.

Tutorials will be offered depending on students' interests and will be limited by the amount of faculty time that is available. Arrangements must be made with individual faculty members.

MCHA 330. Field Study

One-week period between fall and spring terms. 1 unit.

Field study will be arranged on an individual basis to meet the special needs of each student insofar as possible. A group field study to Mississippi is offered prior to the course MCHA 208. Limited travel fellowships are available.

Additional Field Study

Students who lack sufficient previous experience are encouraged to undertake a period of field study before registration or after completion of the academic year, in a program arranged by the staff of the Department. No credit is allowed for such field study.

MCHA 350. Research

Doctoral students may undertake research in maternal and child health or aging by arrangement with the Chairman of the Department.

Microbiology**MIC 202b. Critiques of Current Literature on Infectious Diseases**

Seminars. *One 2-hour session each week. 1 unit.* Members of the Department.

Papers on topics of general interest are selected from current periodicals and critically reviewed as to soundness of experimental design, validity and significance of results and conclusions, organization of manuscript, and clarity of presentation. The course will not be given if less than 8 students enroll.

MIC 203d. Clinical Problems in Infectious Diseases

Lectures, clinics. *One 2-hour session each week. 1 unit.* Dr. Louis Weinstein (Visiting Professor of Medicine, Harvard Medical School).

Problem cases concerning diagnosis, treatment, and control of the common acute communicable diseases of temperate climates are presented, together with discussions of infectious diseases that are usually not considered communicable.

MIC 204c. Immunologic Aspects of Infectious Disease

Lectures and discussions. *One 2-hour and one 1-hour session each week. 2.5 units.* Dr. Eardley. Contemporary topics in immunoregulation will be considered in the context of a selected number of bacterial and viral infections. Particular emphasis will be given to the cellular basis of the immune response focusing on mechanisms of host recognition and reaction. Students must have basic courses in microbiology and immunology and approval of the instructor.

MIC 205a,b/205c,d. Departmental Seminar

Seminars. *One 1-hour session each week. 1.25 units each semester.* Dr. Grant, Dr. Eardley, Members of the Department.

Students and Faculty will present research seminars and current literature reviews. Topics will include epidemiology, molecular biology, immunology, and virology as they relate to infectious disease or oncogenesis.

MIC-PHY 212ab. Introduction to Cancer Biology

Lectures and discussions. *One 2-hour session each week. 2.5 units.* Dr. Cairns, Dr. Kennedy, Dr. Eisenstadt.

Considers the biology of cancer and the process of carcinogenesis, using both epidemiological and experimental evidence. The topics covered will include the biology of cell modification and differentiation, the phenotype of the cancer cell, the properties of human and animal cancers, the process of cell transformation, the general features of the epidemiology of cancer and what these say about the biology of cancer. Early in the course, three introductory lectures will be given on the basic concepts of molecular biology.

A background in some branch of science is desirable for those taking this course.

MIC 213d. Intracellular Microorganisms Pathogenic for Man

Laboratory exercises, seminars. *Two 3-hour sessions each week. 2.5 units.* Members of the Department.

Provides an understanding of the techniques available for studying the growth and the characteristics of representative strains of rickettsiae, chlamydiae, and viruses which are human pathogens. Under staff supervision, each student performs the procedures for identification and characterization of unknown pathogens.

Enrollment limited to 16 students with prior approval of the instructors. The course will not be given if less than 6 students enroll.

Prereq. MIC 204c or equivalent.

MIC 214b. Case Studies in the Epidemiology of Infectious Disease

Lectures, seminars and workshops. *One 2-hour session each week. 1.25 units.* Dr. Nichols.

Describes the information and organization required to install and maintain epidemiological surveillance of infections and other acute diseases. Laboratory support mechanisms are discussed. Students assume the role of investigator or control officer in case studies of epidemics and other acute disease control problems.

Prereq. BIO 101a, b or equivalent, EPI 201a or 221a,b.

MIC 217b. Virology

Lectures, seminars. *Three 1-hour sessions each week. 2.5 units.* Dr. Essex, Dr. Falk.

Provides students with fundamentals of human virology and introduces the new and relevant concepts emanating from recent and ongoing research. Topics include: virus-host cell interaction, pathogenesis, chronic and latent infections, epidemiology, environmental factors, host defense mechanisms, and community control measures. Selected virus groups discussed in detail. Suggest students discuss enrollment with instructor before registering.

MIC 219c,d. Advanced Cancer Cell Biology (Biophysics 203)

Lectures. *One 2-hour session each week. 5 units.* Dr. Haseltine, Dr. Chen (Assistant Professor of Pathology, Harvard Medical School).

This is an advanced level course for those planning to do research in the areas of carcinogenesis, tumor cell biology and cancer pharmacology. Examines the nature of cancer at the molecular level. Explores the differences between normal cells and tumor cells in animals and in tissue culture. Draws upon cell biology, viral oncology, tumor immunology, and genetics. Specific topics include: viral and chemical carcinogenesis, genetics of cancer and the transformed state, the nature of virus coded transformation functions, exogenous control of cell growth, the cell surface of normal and transformed cells, cell structure and motility, the differences between benign and malignant tumors, the problem of metastasis, and mutation and differentiation as models for cancer.

Suggested prereq. Cell Biology 202, The Biology of the Cancer Cell, Biochemistry 165, Oncogenic Viruses.

MIC 300a,b,c,d. Tutorial Programs

Time and credit to be arranged. Members of the Department.

Enrollment requires the consent of the staff member responsible for supervision of the research. The various subject areas are listed below by category.

302 Viruses

Dr. Cerny, Dr. Essex, Dr. Falk, Dr. Haseltine.

Isolation and identification of representative viruses by use of cell culture, animal inoculation, and serologic techniques.

303 Immunochemical Methods

Members of the Department.

Experiments with immunofluorescence, chromatography, immunoelectrophoresis, enzyme-coupled antibody, labeled isotopes, and other techniques applied to research on microorganisms and mechanisms of hypersensitivity.

304 Public Health Laboratory

Associates at the State Laboratory Institute.

The State Laboratory Institute is engaged in a variety of programs related to public health. These include the development, preparation, and testing of new and standard serums, vaccines, and blood fractions; research in various aspects of applied immunology; various aspects of diagnostic service in the fields of bacteriology, virology, and congenital metabolic disorders; and field studies on arboviruses. Individual arrangements for study can be made in any of these programs.

305 Tumor Biology

Dr. Essex, Dr. Cairns, Dr. Cerny, Dr. Eardley, Dr. Eisenstadt, Dr. Falk, Dr. Grant, Dr. Haseltine.

Approaches and techniques for the study of cancer as an infectious disease. Procedures used to study tumor cell and tumor virus marker antigens and antibodies demonstrated. The significance of these markers for epidemiological, etiological, and diagnostic investigations of various tumor systems of known and unknown cause discussed. The relationship between the immune response and the oncogenic process examined.

306 Cellular Immunology

Dr. Cerny, Dr. Eardley, Dr. Grant.

Examines the events following immunization or infection where the quality and quantity of the immune response is regulated by subsets of lymphocytes and their products. The mechanism of this regulation is explored by analyzing immunologic circuits, idiotypic recognition, and antibody and cell mediated cytotoxicity.

308 Health Problems in Selected Underdeveloped Countries

Dr. Nichols.

Problems are studied in the historical context of their political, socioeconomic, and cultural development. Reading assignments are discussed in small seminars. Students with experience in international health preferred.

MIC 350. Research

Qualified doctoral candidates, research fellows, and full-time special students may register for MIC 350 to undertake original research in virology, bacteriology, immunology, or in one of the disciplines available at the State Laboratory Institute. A number of the current research activities of the Department are indicated under MIC 300. Inquiries about specific research opportunities should be addressed to the Chairman of the Department.

Nutrition

NUT 201a,b. Principles of Nutrition

Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Thenen.

An in-depth study of nutrients in relation to human health. The essential nutrients, their requirements and their functions in the organism will be covered, as well as the important health issues related to nutritional deficiencies and excesses in industrialized countries. Provides the foundation for other courses in nutrition.

NUT 203c,d. Nutrition Policy Formation and Program Operation

Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Austin.

Deals with the formation of food and nutrition policies and the operation of nutrition intervention programs aimed at the major nutritional problems in the United States and in the developing nations. Employs a multidisciplinary and case study approach to develop skills in analyzing and formulating nutrition policies and plans, and to sharpen problem-solving and decision-making capacities regarding nutrition program operation. Prereq. NUT 201a,b or NUT 210a,b or permission of the instructor.

NUT 204a,b/204c,d. Departmental Seminars

Seminars. *Two 1-hour sessions each week. 2.5 units each semester.* Dr. Owen, Members of the Department.

Students participate in and present seminars reviewing current research and publications related to nutrition in addition to attending advanced seminars presented by faculty and guest speakers. Beginning students learn skills required for oral presentations. Topics include both basic research and applied areas of nutrition.

NUT 205c,d. Biochemistry and Physiology of Nutrition

Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Hayes, Members of the Department.

The biochemistry and physiology of carbohydrates, fat, protein, vitamins, and minerals are integrated from the nutritional perspective. Course provides an in-depth analysis for students with a major interest in nutritional biochemistry.

Prereq. Course in biochemistry and permission of the instructors.

NUT 206c,d. Laboratory and Animal Research Techniques

Lectures, demonstrations. *One 3-hour session plus 2 additional hours each week. 5 units.* Reduced credit may be arranged for students not majoring in nutrition. Dr. Geyer, Dr. Antoniadis, Dr. Nicolosi, Members of the Department.

Opportunity to learn the principles and practice of modern experimental animal and laboratory research techniques by means of discussions and laboratory work. The course involves both instrument-oriented and project-oriented exercises. The latter includes studies with animals and/or mammalian cell cultures as well as subcellular systems.

MCHA-NUT 207c,d. Nutrition in Child Growth and Development

Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Dwyer.

(Course described under Maternal and Child Health and Aging.)

NUT 208c,d. Nutritional Aspects of Human Disease

Lectures, case presentations, discussions. *One 2-hour session each week. 2.5 units.* Dr. Herrera-Acena, Dr. el Lozy, Mrs. Witschi, Members of the Nutrition and Dietetics Department, Peter Bent Brigham Hospital.

Reviews the role of diet in the causation and management of clinical obesity, diabetes mellitus, coronary artery disease, anemia, liver disease, alcoholism, gastrointestinal disorders, and renal disease. Early detection and prevention of these nutrition-related disorders considered.

NUT 209a,b. Food Science and Nutrition

Lectures, discussions. *Two 1-hour sessions each week. 2.5 units.* Mrs. Witschi, Dr. Samonds, Members of the Department.

Deals with nutrition in terms of the foods which supply mankind's nutrient needs, their composition and physical properties, and the positive and negative effects on nutrient qualities of food of genetic manipulation, agricultural practice, processing, storage, and cooking. The historical development of food technology, including methods of preservation and sanitation, is related to current methods employed in both developing and industrialized countries.

NUT 210a,b. Nutrition Problems of Less Developed Countries

Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Herrera-Acena, Dr. Mora. The nutrition problems of less developed countries are discussed in the context of basic human needs. The ecology and the biological and behavioral consequences of malnutrition are reviewed in detail. Special emphasis on issues in human biology relevant to the formulation of nutrition policy and programs.

NUT-EPI 213a,b. Nutritional Epidemiology

Lectures. *One 2-hour session each week. 2.5 units.* Dr. el Lozy, Dr. Willett, Mrs. Witschi. Reviews methods for assessing dietary intakes of populations and individuals. Students will gain experience in the actual collection, analysis (including conversion to nutrients by computer) and interpretation of dietary intakes. Case studies follow, involving specific diet disease relationships integrating information from international studies, secular trends, clinical trials, analytical epidemiology, and animal experiments.

Prereq. BIO 101a,b, EPI 201a or 221a,b, and permission of the instructor for students who have not taken a course in nutrition.

NUT 300a,b,c,d,e. Tutorial Programs

Time and credit to be arranged.

Individual work under direction may be arranged. This can include laboratory studies, projects in applied nutrition, or library research.

NUT 350-368. Research

Time and credit to be arranged.

Facilities are available for doctoral students to do advanced work in nutrition along the lines of fundamental or applied research as related to public health and medicine. Areas currently receiving intensive and comprehensive study in the Department are as follows:

351 Dr. Geyer

Effects of growth factors and hormones on the metabolism of human cells in culture; nutrition and metabolism of isolated organs; complete blood replacement *in vivo* with artificial preparations.

353 Dr. Lown

Coronary artery disease; etiology of sudden death; derangements of the heart beat; exercise physiology; electrolyte metabolism.

- 356 Dr. Antoniades
Regulation of cell growth by hormonal growth factors derived from human serum or platelets; platelet-derived growth factor and atherogenesis; mechanisms of hormone transport and regulation.
- 357 Dr. Hayes
Nutritional pathology with specific interest in diet and disorders of lipid and lipoprotein metabolism, particularly atherogenesis in non-human primates.
- 358 Dr. Herrera-Acena
The role of nutrition and other environmental factors in the etiology and management of diabetes mellitus; the relationship of malnutrition to physical and cognitive development.
- 359 Dr. el Lozy
The quantitation of malnutrition in children in developing countries on the basis of anthropometric measurements; studies of mathematical models of growth; application of these models to the study of growth in chronic diseases of childhood (diabetes, cystic fibrosis, etc.).
- 360 Dr. Mora
(*On Leave of Absence 1981-1982*)
The epidemiology of malnutrition, physical growth deficit, and cognitive retardations.
- 361 Dr. Thenen
Early development and the role of nutrition in obesity and insulin resistance in experimental animal models; effects of marginal folic acid deficiency on reproduction, hemopoiesis and resistance to infection; biochemical defects in vitamin B₁₂ deficiency.
- 362 Dr. Verrier
Influence of neural factors, psychologic conditioning, and myocardial ischemia on susceptibility to ventricular arrhythmias and sudden death.
- 363 Mrs. Witschi
Computer-based interactive dietary history, analysis, and counseling programs.
- 364 Dr. Austin
Cost effectiveness of infant and child supplemental feeding in the United States. Cost-benefit methodology for assessing safe levels of food additives.
- 365 Dr. Huber
Trace mineral metabolism.

- 366 Dr. Franceschi
Control of intestinal calcium absorption by 1,25-dihydroxyvitamin D₃, a steroid hormone. Regulation of gene expression by steroid hormone receptors. Mechanism of intestinal calcium transport.
- 367 Dr. Lieberman
The involvement of the cell surface in the following processes are being examined in cultured mammalian cells: regulation of cell growth, regulation of amino acid transport; phosphorylation as a growth regulating mechanism; and cellular differentiation.
- 368 Dr. Owen
Hormonal regulation of nutrient uptake and membrane function in human cells. Mechanism of action of growth factors. Regulation of amino acid transport and protein synthesis.

Admission limited and subject to approval of the instructor.

The following course, offered in the Faculty of Arts and Sciences, may be of particular interest to students of nutrition.

Dd-102. Dudley House Seminar: Blood

Half course (*spring term*). Tu., 3-5. Antoniades.
Note: Enrollment limited to 20.

Physiology

PHY 203a,b. Human Physiology

Lectures, conferences, demonstrations. *Two 1-hour and one 2-hour sessions each week. 5 units.* Dr. Mead, Members of the Department.

Students lacking a background in biology are offered an intensive introduction to biological principles and to the physiology of cells, organ systems, and organisms. Some pathophysiology and a number of laboratory exercises are included.

Prereq. College courses in physics, chemistry, and mathematics, or permission of the instructor.

PHY 205c,d. Principles of Toxicology

Lectures, seminars. *Two 2-hour sessions each week. 5 units.* Dr. Tashjian, Members of the Laboratory of Toxicology.

Emphasis placed on mechanisms of injury resulting from exposure to environmental chemicals at the molecular, cellular, organ system, and organismal levels. Methods used to detect, evaluate, analyze, and combat the toxic effects of chemicals are discussed.

Prereq. Organic chemistry, biological chemistry, and mammalian physiology.

PHY 206a,b. Pulmonary Cell Biology

Lectures. *One 2-hour session each week.*

Laboratory/review sessions. *To be arranged. 5 units.* Dr. Sorokin, Dr. Brain, Members of the Department, Guest Lecturers.

To be given 1981-82; offered alternate years. Surveys pulmonary structure and function, trachea to alveolus, from the viewpoint of cell biology. Examines biological properties of the more than 40 cell types present and considers how cell and tissue functions are integrated to provide for respiration, defense against airborne infection, and other metabolic functions. Knowledge gained in this course helps prepare the student for research on the lungs and helps give insight into pulmonary disease. Prereq. College-level course in histology or cell biology; otherwise permission of the instructor. Those without skill in interpreting morphological data will be at a disadvantage.

PHY 207c,d. Radiation Biology

Lectures. *Three 1-hour sessions each week. 5 units.* Dr. Little.

This course is divided into two parts: cellular and mammalian radiobiology. The first includes radiation chemistry; cell survival, transformation, and mutagenesis; cytogenic effects; UV-photobiology; and cellular and molecular repair processes. The second covers effects of radiation in man and characteristics of internal and external human exposure. The biologic basis of the acute radiation syndrome, and the human epidemiologic data for radiation carcinogenesis, are emphasized.

Prereq. PHY 203a,b or college-level course in biology.

PHY 208a,b/208c,d. Seminar in Toxicology

Seminars. *One 1-hour session each week. 1 unit each semester.* Dr. Tashjian, Members of the Laboratory.

Not given 1981-82.

Seminars, journal clubs, and discussions of topics in basic research and the current literature in toxicology and related fields.

Prereq. Background in toxicology and permission of the instructor.

PHY 210a,b/210c,d. Advanced Toxicology

Lectures, discussions, seminars. *One 2-hour session each week.*

Laboratory. *To be arranged. 5 units.* Dr. Tashjian, Members of the Laboratory.

Not given 1981-82.

Examines experimental methods of research in toxicology. Includes individual laboratory work.

Prereq. PHY 205c,d or equivalent and permission of the instructor.

MIC-PHY 212a,b. Introduction to Cancer Biology

Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Cairns, Dr. Kennedy, Dr. Eisenstadt.

(Course described under Microbiology.)

PHY 260a,b/260c,d. Evaluation of Occupational Health Problems

Seminars, discussions. *One 2-hour session each week. 5 units each semester.* Dr. Wegman, Members of the Occupational Health Program.

Students will examine a specific occupational health problem either as an applied research project or as an analysis and evaluation of an occupational disease control program. The weekly seminar will provide the opportunity for student and faculty review of each project plan, data collection effort, approach to analysis, and final report. Faculty and guests will, in addition, discuss problems of a similar nature and how each have been evaluated and answered.

Prereq. BIO 101a,b, EPI 201a or 221a,b, EPI 202b, EHI 251c,d, EHI 254b and permission of the instructor.

PHY 272a,b. Structure and Function of the Mammalian Respiratory System (Biology 272)

Lectures. *One 3-hour session each week.*

Demonstrations, discussions. *To be arranged. 5 units.* Dr. Brain, Dr. Leith, Dr. Mead, Dr. McMahon (Professor of Biology, Division of Applied Sciences), Dr. Taylor (Professor of Biology, Faculty of Arts and Sciences).

To be given 1982-83; offered alternate years.

An introduction to the structure and morphology of the respiratory system of mammals (from lung to mitochondria) integrating structural and morphometric information with physiological data. Requirements include lectures, demonstrations, discussions, term paper, and oral presentations.

Prereq. College-level course in histology or cell biology.

PHY 300. Tutorial Programs

Time and credit to be arranged.

Opportunities are provided for tutorial work in the fields of respiratory biology, toxicology, occupational medicine, and radiobiology.

PHY 350. Research

Doctoral candidates may undertake laboratory or field research under the direction of faculty members working in the following areas:

Occupational health

Dr. Wegman, Dr. Baker, Dr. Boden.

Radiobiology and experimental carcinogenesis

Dr. Little, Dr. Kennedy, Dr. Reynolds.

Respiratory biology

Dr. Mead, Dr. Banzett, Dr. Brain, Dr. Butler, Dr. Drazen, Dr. Feldman, Dr. Gehr, Dr. Hoppin, Dr. Leith, Dr. Loring, Dr. Sorokin, Dr. Valberg.

Toxicology

Dr. Tashjian, Dr. Eisenstadt, Dr. Greenlee, Dr. Ofner, Dr. Richardson, Dr. Schonbrunn, Dr. Rice, Dr. Toscano.

Community air pollution

Dr. Ferris.

Population Sciences

POP 185a,b. Applied Mathematical Demography (Sociology 185)

Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Keyfitz.

Topics include: probabilities of survival and of childbearing; the general one-sex model and the stable special case; parity and interbirth intervals; cohorts and periods; and extension to two sexes and to changing rates of birth and death. Also covered are application to population prediction, inferring birth rates from censuses, occupational mobility, migration, kinship, and effects of birth control.

Prereq. One year of calculus.

POP 191a,b. The Spatial Aspects of Societies (Sociology 191)

Lectures. *Two 1-hour sessions each week. 5 units.* Dr. Alonso.

Stresses the interaction of societies and their geography, focusing primarily on the historic and current development of the United States. Consideration is given to technology, institutions, ideology, health, the economy, and other factors influencing the growth and shape of cities, their relations to each other and to rural areas.

POP 200a,b. Introduction to Population Sciences

Lectures. *Two 1-hour sessions each week. 2.5 units.* Members of the Department.

Reviews the basic interrelationships among fertility, mortality, and migration. Their interaction with social, cultural, and economic characteristics of societies is discussed for countries at each stage of the demographic transition, i.e., for both developed and developing countries. Introduces basic demographic concepts and methods, including age-sex pyramids, life tables, demographic rates, and kinds of surveys needed for collection of data.

POP 201a,b. Introductory Seminar on Population Sciences

Seminars. *One 2-hour session each week. 2.5 units.* Members of the Department.

Supplements the introduction to population sciences presented in POP 200a,b. Most students will be concurrently enrolled in 200a,b. Topics include: basic physiology of human re-

production, contraceptive methods, population ethics, design of population programs, relationship between population growth and economic development, and contraceptive use in the United States. Several short papers will be required.

Prereq. Previous or concurrent enrollment in POP 200a,b.

POP 202c,d. Student Project Design Seminar

Seminars. *One 2-hour session each week. 2.5 units.* Dr. Wyon, Members of the Department.

Oriented toward health and population problems of communities. Each student selects a community and an appropriate health or population problem. He/she presents a critical survey of the relevant literature and a project design, to amplify understanding of the relative frequency of the selected problem in relation to other health or population problems of the community, and to increase or test the available knowledge of causes of the problem.

Prereq. Introductions to biostatistics, epidemiology and (preferably) population sciences. Enrollment after interview with instructor.

POP 203c. Demographic Methods for Developing Countries—Mortality

Seminars. *One 2-hour session and one 1-hour session each week. 2.5 units.* Members of the Department.

Introduces the basic demographic methods for analysis of mortality in developing countries. Includes estimation of mortality levels and trends from survey data and from prospective studies. Techniques for studying cause of death, program impact and age patterns of mortality are emphasized.

POP 203d. Demographic Methods for Developing Countries—Fertility

Seminars. *One 2-hour session and one 1-hour session each week. 2.5 units.* Members of the Department.

Introduces the basic demographic methods for analysis of fertility related problems in developing countries. Topics include: estimation of fertility rates and trends from survey data, faulty vital statistics data and prospective studies, cohort and period approaches to fertility trends, techniques for studying the determinants of fertility rates, and methods for evaluating the impact of family planning programs. In addition, techniques for population projection and for studying marriage rates will be discussed.

POP 204c,d. Biological Basis for Fertility Control

Lectures. *Two 1-hour sessions each week, with a third hour at the discretion of the instructor.*

Laboratory. *Six 2-hour sessions, to be arranged. 5 units.* Dr. Salhanick, Members of the Department.

Presents the fundamental physiology and biochemistry related to known and potential methods of family planning. Topics include: the biosynthesis, secretion, effects, and modes of action of the gonadal and gonadotropic hormones; and the relationship of the natural steroid hormones to synthetic analogues is also discussed. Laboratory sessions include demonstrations of a family planning clinic, an infertility unit, and procedures for sterilization and pregnancy termination.

Prereq. POP 200a,b and appropriate science background.

POP 207a,b. Essentials of Human Reproduction

Lectures. *Two 1-hour sessions each week.*

Laboratory. *One 2-hour session each week. 5 units.* Dr. Berggren, Dr. Holtrop.

Designed for non-physicians to review key facets of human reproduction. Considers basic and applied aspects of embryology, anatomy, physiology, endocrinology and genetics. Lectures and laboratory exercises are supplemented by required readings. Special attention is directed to sexual behavior as it relates to reproduction and contraception. Field methods to assess reproductive functions are reviewed. A background in biology is desirable.

POP 209a,b. Foundations of Agricultural Sciences (Biology 195)

Lectures, seminars. *Two 1½-hour sessions each week. 5 units.* Dr. Levins.

Examines patterns of world food production as it develops from the interaction of social and biological systems: evolution of agro-ecosystems, principles of plant growth and productivity, pests and diseases, ecology of farming systems, consequences of technical choices, issues of agricultural change, and research strategies.

Prereq. Course in biology or permission of the instructor.

POP 209c,d. Population Biology

Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Lewontin, Dr. Levins.

Approaches population studies from a general biological standpoint. Attempts to integrate population and community ecology, population genetics, and biogeography. Topics include: the structure of the environment in space and time and its interaction with organisms, simple single-species growth dynamics, age-dependent demography, two-species interactions, multiple-species community dynamics, evolution of the niche, elements of population genetics, and topics in biogeography.

Prereq. College courses in calculus and biology.

POP 212a,b. An Economic Approach to Population Policy

Lectures. *One 2-hour session each week, with a third hour at the discretion of the instructor. 5 units.* Dr. Repetto.

Presents the economics relevant to the formulation and evaluation of population policies in developing countries and surveys knowledge about the effectiveness of intervention strategies. Covers welfare economics of population policies; interactions between fertility and economic development; the impact on population growth of policies which affect incomes, education, survivorship, old-age security, and related variables, as well as conventional family planning programs.

Prereq. POP 200a,b and HPM 205a,b or equivalent.

POP 214c,d. The Biological Determinants of Fecundity, Environmental Factors, and Population Growth

Lectures. *One 2-hour session each week. 2.5 units.* Dr. Frisch.

Deals with the direct effect of environmental factors such as nutrition and physical work on fecundity, through the effects on age of menarche, age of male maturation, length of adolescent subfertility, nubility, lactational amenorrhea, pregnancy wastage, and age of menopause. Contemporary and historical data on these biological factors from different cultures will be considered, as well as their interactions with social customs.

POP 216c,d. Comparative Analysis of Public Policies in Developing Countries (Government 211)

Lectures, seminars, workshops. *One 2-hour session each week. 5 units.* Dr. John D. Montgomery (Professor of Public Administration, John F. Kennedy School of Government). Examines patterns of policy making across cultures and issue areas, including interactions between policies and social contexts. Surveys Third World policies for dealing with such problems as population (fertility and migration); malnutrition; land reform; and management of large-scale irrigation systems. Applies the policy sciences approach to the formulation and implementation of large-scale programs of public intervention in social processes.

POP 217b. Introduction to Community Diagnosis of Birth and Death Rates in Developing Countries

Lectures, discussions. *One 2-hour session each week. 1.25 units.* Dr. Wyon.

Helps students distinguish within communities those kinds of persons at high risk of serious illness, death, and unwanted births. It uses data from studies at national and local levels to trace underlying causes of these events as the basis for designing feasible, effective, and simple preventive measures. Provides foundation for POP 202c,d and for other health and population courses considering policies and programs.

Prereq. Introductory courses in biostatistics, epidemiology, and (preferably) population sciences.

POP 220d. Human Ecology

Lectures, seminars. *Two 1-hour sessions each week. 1.25 units.* Dr. Levins.

Provides a broad overview of the human ecosystem as it emerges out of, but is different from, pre-human ecology. For each area of ecology, general principles will first be considered followed by examples from different human societies. Also considers the role of knowledge and conscious planning as an aspect of human ecology and examines approaches toward the solution of ecological problems.

Prereq. Assumes basic knowledge of biology.

HPM-POP 262c,d. Health Planning in Developing Countries

Lectures, seminars. *One 2-hour session each week.*

Laboratory. *One 1-hour session each week (optional). 5 units.* Dr. Cash, Dr. Shepard.

(Course described under Health Policy and Management.)

POP-HPM 263c, 263d. Case Studies in Design and Management of Population and Health Programs

Case discussions, seminars. *Two 2-hour sessions each week. 2.5 units each period.* Dr. Wyon, Dr. Berggren, Members of the Department.

Addresses, from a managerial perspective, the problems of developing and implementing population and primary health care programs in Third World nations. Problems are examined from the level of the community, the program manager, and the national development planner. Topics covered primarily through case studies based on family planning, health, nutrition, and rural development programs. The "c" period stresses programs at the community and regional levels. The "d" period is devoted to management of population programs in the context of national development.

POP 285a,b. Applied Mathematical Demography Seminar (Sociology 285)

Seminars. *One 2-hour session each week. 5 units.* Dr. Keyfitz.

Consists of research on the topics of POP 185a,b.

Enrollment subject to approval of the instructor.

POP 300. Tutorial Programs

Time and credit to be arranged.

Students at the master's level may make arrangements for tutorial work and special reading on topics related to population problems. There may be an opportunity to consider the design of studies, programs, or analysis of data.

POP 330e. Field Studies

During the week between the fall and spring semesters and/or a week at the end of the academic year. Dr. Berggren.

Field Trip to Haiti

The objective of this field study is to provide exposure to the urban, rural, and development problems of a developing country. Students visit the homes of rural farmers to observe the living conditions of these families and their accessibility to health care facilities and programs. Students also see rural health centers, health surveillance teams, nutrition programs, and the headquarters of various health programs. What has been observed, how it relates to data previously collected, and what programs can be developed to improve the conditions are then discussed with the group's leaders and with local health planners. Enrollment limited to 10 and subject to approval of the instructors.

Field Trip to the Dominican Republic

The objective of this field trip is very similar to that above; however, greater emphasis is placed upon family planning problems and programs in the Dominican Republic. Students will visit health centers, maternal and child health and family planning programs, and the headquarters of various health programs. These observations form the basis of discussions between the students, group leaders, and local health planners about what is being done and what can be done to solve the problems. Mr. Luis Gonzalez, an alumnus of the School and Head of Family Planning in the Dominican Republic, is the host for this visit. Enrollment limited to 6 and subject to approval of the instructors.

Note: One or both of these field trips may be made available during an academic year.

POP 350-355. Research

Time and credit to be arranged.

Candidates for doctoral degrees may undertake research in the Department or may integrate research in population sciences with a doctoral program in another department or at the Center for Population Studies.

Members of the Department and of the Center for Population Studies are currently engaged in research in the following areas:

- 350 *Field studies and programs*
Dr. Wyon, Dr. Guerrero, Dr. Berggren.
- 351 *Biomedicine and reproductive physiology*
Dr. Salhanick.
- 352 *Demography*
Dr. Keyfitz.
- 353 *Population ethics*
Dr. Dyck, Dr. Potter.
- 354 *Population economics*
Dr. Repetto.
- 355 *Complex systems*
Dr. Levins.

The following courses, offered by other faculties of Harvard University, are among those that may be of particular interest to students of population sciences. They are open to qualified students from the School of Public Health.

Ethics 284. Seminar: Ethical Aspects of Population Policy

Half course (*spring term*). *Hours to be arranged.* Dyck.

Sociology 251. Seminar: Social Policy and Population Issues in the Developed Countries

Half course (*spring term*). M., 2-4. Alonso.
A broad range of issues in the developed countries, including education, health, housing, social security, status of women, labor policy, racial and group prejudice, are affected by declining fertility, growing up of the baby boom generation, and international migration. Stresses social processes involved and the policy responses proposed and tried out. (Offered in the Faculty of Arts and Sciences.)

Sanitary Engineering

ENG SCI 171. Chemistry of the Aqueous Environment

Half course (*fall term*). M., W., F., at 1. Lab. Tu. 1-4. Professor Butler.

Chemical principles applicable to environmental science and engineering. Emphasis on pH, complex formation, and solubility in multicomponent systems. Sources, occurrence, and chemical reactions of important constituents in natural waters. Natural aquatic cycles and their disruption by human activity. Processes affecting the fate of toxic chemicals in fresh water and marine environments.

Prereq. CHEM 11 or equivalent.

ENG SCI 172. Hydrologic Cycles

Half course (*fall term*). Tu., Th., 9:30-11.

Professor Fiering.

To be given 1982-83; offered alternate years.

Physical mechanisms which govern the movement of water over, under and on the earth. Water budgets, basin characteristics, groundwater transport, direct and indirect observational methods, sampling and network techniques, models of water bodies, quantitative and qualitative assessments of water resource systems, mechanistics and statistical descriptions of extremes.

Prereq. APPL MATH 21b and one year of college-level physics.

ENG SCI 173. Introduction to Environmental Microbiology

Half course (*spring term*). M., W., F., at 11 and laboratory hours to be arranged.

Professor Mitchell.

Introduction to the ecology of microorganisms. Examination of the role of microorganisms in water pollution and its control.

Prereq. Biology 7 or its equivalent.

ENG SCI 175. Introduction to Environmental Engineering

Half course (*spring term*). Tu., Th., 11-12:30.

Professors Rogers and Harrington.

To be omitted 1982-83; offered alternate years.

Introduces engineering technologies for control of the environment and relates them to underlying scientific principles. Efficient designs of environmental management facilities and systems. Cases from aquatic, terrestrial and atmospheric environments will be discussed.

For graduates without background in environmental engineering. Prereq. Any two of ENG SCI 171, 172, or 173, which may be taken concurrently. APPL MATH 21a and 21b or equivalent mathematical background.

ENG 250. Design of Water Resource Systems

Half course (*fall term*). Tu., Th., 9:30-11.

Professor Thomas.

Principles of engineering and economic analysis applied to water resource systems. Functional design of management systems for collection, storage, conveyance, treatment, and distribution of water. Uses techniques of operations research to develop methods for planning integrated systems of dams, reservoirs, canals, pipe networks, and treatment plants. Applications in water supply, irrigation, hydropower, environmental protection, and conservation of wildlife.

Prereq. APPL MATH 105a; ENG SCI 121, 123 or equivalents.

ENG SCI 251. Seminar: Technology Choice in Water Resources Development

Half course (*spring term*). Hours to be arranged.

Professor Rogers.

To be given 1982-83; offered alternate years.

Discusses the technology available for water resources development. Relates the characteristics of the technology to methods for evaluating technology choice. Focuses upon water supply and delivery systems and hydropower facilities. Emphasis on applications in developing countries.

ENG 253. Stochastic Processes in Environmental Engineering

Half course (*fall term*). Hours to be arranged.

Professor Fiering.

Will not be given 1982-83. Material will be included in **Applied Mathematics 216** in 1981-82; problems will be chosen to illuminate hydro-meteorological questions.

Theory and application of statistical methods in estimation of hydrologic extremes; spectral analysis; flow synthesis, theory of storage, robust estimation techniques, runoff and groundwater models.

ENG 257. Seminar: Models for Environmental Systems Planning

Half course (*throughout the year*). Tu., 12-2. Professor Harrington.

Critical evaluation of current systems applications; biology and chemistry in environmental science, with emphasis on models for the analysis of water quality standards, optimality, and resilience in water-resource systems. Papers and presentations are required. Students intending to enroll should meet with the instructor to arrange scheduling before study cards are due.

ENG 270. Engineering Systems for Environmental Control

Half course (*spring term*). M., W., F., at 10. Professor Harrington.

To be given 1982-83; offered alternate years.

Provision of urban water; engineering aspects of the collection and disposal of spent water and solid wastes; significant interchanges between the gaseous, liquid, and solid phases of the environment; geographic interchanges; time-dependent developments. Data collection and processing for monitoring and control; maintenance and operation of pollution control systems.

Prereq. ENG SCI 123 or permission of instructor.

ENG 272. Water Quality and Its Management

Half course (*spring term*). Tu., Th., 11-12:30.

Professor Morris.

Nature, sources, and effects of inorganic and organic impurities in natural waters. Water quality standards. Effects of contaminating and polluting discharges on water quality. Natural purification of surface waters. Chemical and biochemical transformations in lakes and rivers.

Prereq. ENG SCI 171 and 173.

ENG 273. Water Pollution Microbiology

Half course (*fall term*). Hours to be arranged.

Professor Mitchell.

Advanced discussion of the role of microorganisms as both pollutants and purifying agents. Particular attention to ecological approaches to pollution control. Eutrophication, microbial imbalances, degradation of toxic chemicals, and a critical discussion of current pollution control methods.

Prereq. ENG SCI 173 or equivalent.

ENG 274. Chemical Models of Natural and Polluted Waters

Half course (*spring term*). Tu., Th., 1-2:30.

Professor Butler.

To be given 1982-83; offered alternate years.

Chemical aspects of aqueous environmental systems. Mathematical models include thermodynamic, kinetic, biological, and hydrodynamic processes. Applications to water quality management, pollution control, limnology, oceanography, and geology.

Prereq. Physical chemistry (e.g., CHEM 11, ENG SCI 171) and some experience with biology and geology.

ENG 276. Treatment of Water Supplies and Wastewaters

Half course (*fall term*). Tu., Th., 11-12:30.

Professor Morris.

Quality standards for water supplies. Processing of natural water for municipal use, including coagulation, softening, deferrization, disinfection, adsorption, and demineralization. Physical, chemical, and biological treatment of wastewaters, including "advanced" methods. Prereq. ENG SCI 171 or permission of instructor.

Tropical Public Health

TPH 201a. Ecology, Epidemiology, and Control of Important Parasitic and Viral Diseases of Developing Areas

Lectures, seminars, demonstrations. *Four 1-hour sessions each week. 3 units.* Dr. Michelson, Members of the Department.

Provides an introduction to ecological and epidemiologic concepts basic to the control of infectious agents. Considers important parasitic and viral diseases of particular significance in the developing areas of the world. Epidemiologic principles of vector-associated diseases are elucidated through study of entities such as malaria and schistosomiasis. Prior knowledge of the pathogenesis of disease produced by infectious agents is desirable.

TPH 203d. Perspectives in Tropical Health: The Background for Decision Analysis

Lectures, conferences. *One 2-hour session each week. 1 unit.* Guest Lecturers.

Not given 1981-82.

Provides background information on environmental, social, economic, and political factors that influence health programs in the tropics. At each session a distinguished guest lecturer covers an assigned topic, including subjects such as the development of professional education, problems of agriculture, nutrition, and water supply, and the political background of international cooperation. Each presentation followed by informal student discussion. Enrollment open to all students.

TPH 204c. Introduction to the Techniques of Investigation of Parasitic Infections

Lectures, laboratory, seminars. *Two 3-hour sessions each week. One 2-hour additional laboratory session each week, to be arranged. 5 units.*

Dr. Pan.

Emphasizes laboratory methods for the study of parasitic diseases of public health importance. Provides exposure to theory and application techniques essential to epidemiologic and laboratory investigation. Life cycles of several parasites maintained and examined with respect to detection and quantification of infection, immunity, and control.

Enrollment limited to 15 and subject to approval of the instructors. Preference given to concentrators in tropical public health and microbiology.

TPH 205c. Clinical and Pathologic Features of Tropical Diseases

Case presentations, clinico-pathologic conferences, demonstrations. *One 2-hour session each week. 1 unit.* Dr. Dammin, Dr. Boyer, Dr. Franz von Lichtenberg (Professor of Pathology, Harvard Medical School), Members of the Department, Members of the Pathology Department.

Designed for students particularly interested in tropical medicine. Emphasis is on the clinico-pathologic aspects of tropical diseases. At each session disease entities are introduced by presenting a clinical case, and pertinent clinical and pathologic features of the disease are then reviewed.

Enrollment subject to approval of the instructors.

TPH 206d. Principles of Vector Biology

Lectures, laboratories, seminars, field trips. *Three 1-hour sessions and two 2-hour sessions each week. 5 units.* Dr. Spielman, Dr. Michelson.

The manner in which arthropods and molluscs transmit disease and the principles of vector control are discussed from ecological, physiological, and genetic points of view. Class sessions introduce concepts and techniques currently employed in controlling vector-borne disease. Weekend field trips provide an opportunity for students to apply skills acquired in the classroom.

Prereq. TPH 201a or suitable biology background, and permission of the instructors.

TPH 208d. Epidemiology and Control of Schistosomiasis

Seminars, laboratory exercises. *One 3-hour session each week. 2 units.* Dr. Michelson, Dr. Chernin, Dr. Pan, Dr. Weller.

To be given 1981-82; alternates yearly with TPH 210d.

The problems posed by schistosomiasis as an expanding health hazard are presented in a series of seminars and laboratory exercises. Emphasis is given to the biology of snail vectors, to problems of assessment of significance of the disease, and to the potentials of various approaches to control. Opportunity to become familiar with appropriate techniques is afforded in the laboratory.

Prereq. TPH 201a or permission of the instructors.

TPH 210d. Current Problems in Malariology
Seminars, laboratory exercises. *One 3-hour session each week. 2 units.* Dr. Chernin, Dr. Spielman, Dr. Weller, Members of the Department. To be given 1982-83; alternates yearly with TPH 208d.

Supplements the subject material on malaria offered in TPH 201a and TPH 204c. Particular attention is given to problems now encountered in eradication and control programs. In the laboratory, experience is provided with procedures essential to the epidemiologic investigation of malaria.

Prereq. TPH 201a and permission of the instructors.

TPH 218d. Introduction to the Immunology of Parasitic Diseases

Lectures, discussions. *One 2-hour session each week. 1.25 units.* Dr. Boyer, Guest Lecturers. Provides an introduction to the immunology of parasitic diseases for students with a basic knowledge of immunology. Includes the general principles of immunology relating to the host-parasite relationship and the immunological aspects of selected parasitic diseases.

Prereq. Suitable course in basic immunology.

TPH 300a,b,c,d,e. Tutorial Programs

Laboratory exercises. *Time and credit to be arranged.*

Individual work for candidates at the master's degree level may be carried out under supervision of a member of the Department. Various parasites of medical importance are maintained and are available for studies on metabolism, host-parasite relationships, and chemotherapy. Arrangements subject to approval of the instructor.

TPH 350. Research

Doctoral candidates or qualified full-time special students may undertake original investigations in the laboratory or in the field by arrangement with the Chairman of the Department.

Members of the Department are currently engaged in the following areas of research:

- *Cultivation in vitro of parasitic helminths, protozoa, and other invertebrates of medical importance*
- *Biology, host-parasite relationships, and control of molluscan vectors of schistosomiasis and of other parasitic infections*
- *Population genetics, nutrition, and reproduction of medically important arthropods*
- *Arthropod transmission of viral, protozoan, and helminthic agents*
- *Immunology of parasites*
- *Epidemiology of Chagas' disease and schistosomiasis in rural Brazil*
- *Mechanisms of health care in rural Haiti*



New international students reviewed the agenda for the week of Orientation and Registration.

Sharing lab supplies.



Officers of Instruction and Research

Members of the Faculty

William Alonso, A.B., M.C.P. (Harvard University); Ph.D. (University of Pennsylvania), Richard Saltonstall Professor of Population Policy.

Mary Ochsenhirt Amdur, S.B. (University of Pittsburgh); Ph.D. (Cornell University), Associate Professor of Toxicology (*Physiology*); *Lecturer, Massachusetts Institute of Technology*.

James Robert Anderson, A.B. (State University of New York at Buffalo); Ph.D. (University of Washington at Seattle), Assistant Professor of Biostatistics; *Sidney Farber Cancer Institute*.

Harry Nicholas Antoniadis, B.S., Ph.D. (Athens University, Greece), Professor of Biochemistry (*Nutrition*); *Senior Investigator, Blood Research Institute, Inc., Boston*.

James Edward Austin, A.A. (Flint Community Junior College); B.B.A. (University of Michigan); M.B.A., D.B.A. (Harvard University), Lecturer on Nutrition Policy and Programs (*Nutrition*); *Professor of Business Administration, Harvard Business School*.

John Christian Bailar, III, A.B. (University of Colorado); M.D. (Yale University); Ph.D. (American University), Lecturer on Biostatistics; *Senior Scientist, Environmental Protection Agency*.

Edward Lamar Baker, Jr., A.B. (Vanderbilt University); M.D. (Baylor College of Medicine); M.P.H., S.M. in Phys. (Harvard University), Assistant Professor of Occupational Medicine (*Physiology*).

Robert Bruce Banzett, S.B. (Pennsylvania State University); Ph.D. (University of California at Davis), Assistant Professor of Physiology.

Kenneth Paul Barclay, A.B. (Tufts University); M.B.A. (University of Massachusetts, Amherst), Member of the Faculty of Public Health and Associate Dean for Administration.

Diana Barrett, A.B. (Sweet Briar College); S.M. (Boston University); M.B.A., D.B.A. (Harvard University), Assistant Professor of Management (*Health Policy and Management*).

Colin Banks Begg, B.Sc., Ph.D. (Glasgow University), Assistant Professor of Biostatistics; *Sidney Farber Cancer Institute*.

David Elliott Bell, A.B. (Pomona College); A.M. (Harvard University), Clarence James Gamble Professor of Population Sciences and International Health (*Population Sciences*).

Robert Charles Benfari, A.B. (Colby College); M.B.A. (Babson Institute); Ph.D. (Yeshiva University); S.M. in Hyg. (Harvard University), Associate Professor of Psychology (*Behavioral Sciences*).

Gretchen Mary Berggren, A.B. (Nebraska State College); M.D. (University of Nebraska); S.M. in Hyg. (Harvard University), Assistant Professor of Population Sciences; *Science Scholar, Mary Ingraham Bunting Institute, Radcliffe* (to December 1982).

Bengt Erik Bjarngard, M.Sc., D.Sc. (University of Lund, Sweden), Lecturer on Medical Radiation Physics (*Environmental Health Sciences*); *Associate Professor of Radiation Therapy, Harvard Medical School*.

Konrad Emil Bloch, Ph.D. (Columbia University), Professor of Science (*Nutrition*) in the Faculty of Public Health and Higgins Professor of Biochemistry in the Faculty of Arts and Sciences.

Elkan Rogers Blout, A.B. (Princeton University); Ph.D. (Columbia University), Member of the Faculty of Public Health and Dean for Academic Affairs; *Edward S. Harkness Professor of Biological Chemistry, Harvard Medical School*.

Leslie Irvin Boden, A.B. (Brandeis University); Ph.D. (Massachusetts Institute of Technology), Assistant Professor of Economics (*Physiology and Health Policy and Management*).

Markley Holmes Boyer, A.B. (Princeton University); M.D. (University of Pennsylvania); D.Phil. (Magdalen College, Oxford University); M.P.H. (Harvard University), Assistant Professor of Tropical Public Health.

Joseph David Brain, A.B. (Taylor University); S.M., S.M. in Hyg., S.D. in Hyg. (Harvard University), Professor of Physiology.

Laurence George Branch, A.B. (Marquette University); A.M., Ph.D. (Loyola University), Assistant Professor of Social Psychology (*Maternal and Child Health and Aging*); *Assistant Professor of Preventive and Social Medicine, Harvard Medical School*.

Peter Braun, S.B. (Yale University); M.D. (Columbia University), Lecturer on Public Health (*Health Policy and Management*).

J. Larry Brown, A.B. (Anderson College), A.M. (University of California, Los Angeles), M.S.W., Ph.D. (Brandeis University), Lecturer on Health Services (*Health Policy and Management*) and Director of Community Health Improvement Program.

William Alfred Burgess, S.B. (Tufts University); S.M. (Harvard University), Associate Professor of Occupational Health Engineering (*Environmental Health Sciences*); *Corporate Manager of Industrial Hygiene, Polaroid Corp.*

James Preston Butler, A.B. (Pomona College); A.M., Ph.D. (Harvard University), Assistant Professor of Biomathematics (*Physiology*).

John Cairns, M.D., B.A., B.M., B.Ch., D.M. (Oxford University); A.M. (hon.) (Harvard University), Professor of Microbiology.

Richard Alan Cash, S.B. (University of Wisconsin); M.D. (New York University); M.P.H. (The Johns Hopkins University), Lecturer on Tropical Public Health; *Institute Fellow, Harvard Institute for International Development*.

Jan Cerny, M.D. (Charles University Medical School, Prague); Ph.D. (Czechoslovakia Academy of Sciences Institute of Experiment Biology and Genetics, Prague), Associate Professor of Immunology (*Microbiology*).

Lincoln Chih-ho Chen, A.B. (Princeton University); M.D. (Harvard University); M.P.H. (The Johns Hopkins University), Visiting Associate Professor of Population Sciences; *Physician, Ford Foundation*.

Eli Chernin, S.B. (College of City of New York); A.M. (University of Michigan); S.D. (The Johns Hopkins University), Professor of Tropical Public Health.

Douglas Winslow Cooper, A.B. (Cornell University); S.M. (Pennsylvania State University); Ph.D. (Harvard University), Associate Professor of Environmental Physics (*Environmental Health Sciences*).

Allen Latham Cudworth, B.E.E. (University of Alabama); M.E.E. (Massachusetts Institute of Technology); S.D. in Hyg. (Harvard University), Lecturer on Applied Acoustics and Environmental Health (*Environmental Health Sciences*); *Vice President of Liberty Mutual Insurance Company and Director, Hopkinton Research Center*.

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